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Who Can Do It Best?

WE agree with the writer of the article on the "Business of Electricity Supply," on page 911, that little is to be gained by making an elaborate inquiry as to who is to blame for our present want of development.

Several of our contributors seem to consider that the fact that the industry is a technical one, whose course has been largely decided by technical men, is responsible for any lack of commercial spirit and for the half-heartedness of our commercial measures. We shall not expect all of our readers to agree with such a view, but we believe that most of those who have considered the matter at all deeply will hold that the electricity supply industry has now arrived at a point where it demands either the definite controlling and leading hand or the strongly co-operative enterprising management of the man full of ideas and energy for commercial development.

Does it necessarily follow that the engineer who has been responsible for the technical scheme and its execution is qualified, when there is a lull in his new engineering conceptions, to switch over with the required adaptability, enterprise and efficiency to duties which require originality and sound judgment in selling the commodity?

There have been some outstanding cases of engineers who have combined both qualifications and have relegated duties on both sides to capable men, so that engineering advance and commercial plans have been able to proceed hand in hand. But they have generally been the chiefs of large undertakings.

"Protonius" in his article makes a constructive proposition to meet present requirements—the preparation and training of suitable men for the selling of electricity. He calls them commercial engineers, but we are not sure, after all the use that has been made of that term, whether it meets the case—it has often been thought that we might have domestic electrical engineers.

He suggests co-operation between the Institution of Electrical Engineers or the Electrical Development Association and the educational authorities in the establishment of a new form of specialised training. Unfortunately, any such scheme, excellent as it undoubtedly would be, would take too long to become effective in time to bring the needed, and we believe possible, early increase of sales of electricity and apparatus. We still hold that there are available, among electricity supply officials and assistants, technical and commercial, plenty of men who, with a strong lead and the right kind of clerical assistance, could make a marked impression on electricity consumption in a very short space of time.

The fully qualified technical man is, of course, required in connection with industrial works installations, where, as a correspondent says, expert must meet expert. But conversation with a householder is quite a different matter, and needs a more or less qualified domestic canvasser. The playful reference of our correspondent to the unwisdom of sending an M.I.E.E. "to frighten the housewife" will not, we are sure, be misunderstood.

One word on the subject of public ownership. Municipal telephony was destined to fail in this country

because of the local limitations that it entailed. When, years ago, we were discussing that subject, electricity supply was chiefly being regarded as essentially a matter for each city or each town requiring it—there was little thought of the time when a great grid interconnection supply would be the accomplished fact that it is to-day.

The Local Spirit Must Go!

YET does it matter, after all these years, why it is that so much of our work has been local? Who are we that we should blame the pioneers who were experimenting with a new branch of technical discovery, who were doing the best they could against all sorts of adverse circumstances? Is it not enough to know that something *is* wrong, and to try to discover precisely how to set about doing the right thing to develop our national supply to meet totally different domestic and industrial conditions? All local limitations require breaking down if there is to be that free and full flow of cheap electricity from one end of these islands to the other. How can we end the differences in regulations, obstructive and tantalising as they are? How can we secure a general understanding in all towns and areas that a big national policy is required if electricity is to give of its best to the people and to industry? Who is going to end the apathy of municipalities which are smugly self-satisfied? The I.M.E.A. in its November *Journal* followed our lead by recapitulation, but it must go further than this if it is going to educate the municipal councillors who so often hold the reins.

Electrical Posters

A GOOD deal of criticism has been expressed concerning the posters issued to advertise the advantages to be gained by using electricity. Engineers operating in areas whose local characteristics and tastes differ from those existing in the metropolitan area have sometimes inquired where they can obtain the services of an artist who, never having rested in the common rut, can prepare something particularly pleasing which, by its strong original artistic appeal, will leave behind an effective impression regarding electricity itself and why it is so useful. The general advertisement hoardings display some really fine examples in these days. The big board pictures of the Empire Marketing Board tell a story and have been well spoken of, while the "schoolgirl complexion" display leaves a pleasing sense of what follows the use of a certain soap. Electrical critics seek something of this kind rather than a mere slogan or a freak futurist design.

The Hoardings

SOME of the boards to be seen in the area of a leading power company tell a few plain facts regarding the supply; the boards are always well lighted at night, and have struck us as being very businesslike. We have received a new poster issued by E.D.A., much larger than any hitherto produced, to encourage electricity undertakings to make use of large advertisement hoardings. It deals with electric cooking and depicts operations in progress at an electric cooker, but, unfortunately, in our opinion, the lady has her back turned toward the observer, concealing from view the greater part of the stove and depriving us of a view either of her charms or of the operations that are in progress. It seems almost as though the critics are correct in their judgment!

Fourteen Years

THE story of the ups and downs of the Electricity Supply Commercial Association told by Mr. G. R. Smith, the honorary general secretary, in our "Correspondence" pages to-day will, we are sure, be read with interest by all commercial and clerical employés of electricity supply systems, both municipal and company owned. It will be obvious that this movement is a thing apart from any other, for it has next to nothing to do with associated efforts to bring about a bigger consumption of electricity everywhere. It concerns itself with the personal position of such employés, and could perform a very useful work, given a suitable opportunity. The writer suggests that municipal and company commercial men might combine in one organisation if the Central Electricity Board were to take full control of municipal supplies, lock, stock and barrel, separating electrical from other local government services which at present have their own associations. Mr. Smith's account of the fourteen years' life of the Association further suggests that, if some common interest could be found, such an organisation would find plenty to do.

The Process-steam Bogy

THE idea that public electricity supply is out of the question for factories where process steam is required is too firmly rooted in some engineers' minds. More often than not the advantages of public supply could be proved to outweigh those of "steam for nothing." Saving in space and capital, and—of utmost importance—releasing the factory management from work pertaining to electricity generation, thus allowing more time and energy to be spent on the proper function of the works, are "selling points" for the supply man. And the use of process steam is not always what it appears to be. In many cases where the whole of the exhaust is credited to process work, actually only a small proportion of the heat of the steam is required.

Blown to Pieces

WE have no wish to deprive even our keenest competitors of the credit that is legitimately their due. Therefore, amid all the bad reports that are published regarding gas stoves we must willingly let them have the praise that should be theirs. The evening papers are ever ready to attribute fires to fusion of electric wires, but they reported the other day that a London lady, while cooking a steak, was suddenly shocked by the gas stove being blown to pieces. We will not distress our sensitive readers with a recital of the harrowing details of what happened to the steak—they are "better imagined than described"—but we wonder whether a domestic electric cooker has ever been guilty of such an offence as that reported. We have heard of some things—but not exactly that!

Crompton-Parkinson

To be able to show a net profit of £100,021 in fifteen months in times like these—a period of exceptional difficulty owing to the depressed state of trade—is an achievement of which to be proud, but one which the directors of Crompton-Parkinson, Ltd., describe in the modest terms: "The directors consider the results shown to be satisfactory." The figure is down as compared with previous returns, but satisfactory progress has been made in establishing the new lamp, and this should afford a source of profit in future. The period closed on September 30th, 1931, since when there have been foreign exchange disturbances and depression in British gilt-edged securities. The report shows that £20,000 of the general reserve has been set aside to meet losses should these factors prove more than temporary.

Abnormal Imports

THE statistics of our overseas electrical trade during November, which appear in this issue, disclose a very unsatisfactory position. While exports declined by £482,000 as compared with the corresponding month of 1930, imports were £636,305 higher. A striking feature is that the reduction in exports was due to a great extent to lower shipments of telegraph and telephone apparatus, and at the same time this class of goods was mainly responsible for the rise in imports. A similar tendency is exhibited by the machinery section, for whereas exports declined by £174,332, imports were £87,594 higher. An unusual item in the import section was submarine cable valued at £24,100. There was also a large influx of carbons, no doubt in anticipation of the imposition of the Abnormal Imports Duty.

Transmission in the Highlands

Novel construction in the main Grampian system

TO have seen some of the most interesting sections of the e.h.p. transmission lines in the scheme which has been designed and erected by Messrs. Balfour, Beatty and Co., Ltd., for the Grampian Electricity Supply Co., is to have received unique instruction; there is so much of novelty coupled with sound engineering.

The main transmission from the Rannoch power station, described in our issue of December 4th, is effected at 132- and 33-kV, three-phase, with two main circuits for each pressure. As far as Tummel Bridge, about 16 miles, where the second generating works are being constructed, the four circuits and an earth wire are carried on the same masts as one line. This arrangement is believed to be one of the first of its kind at such high pressures in the world, and the line will eventually constitute an interconnection between the two stations.

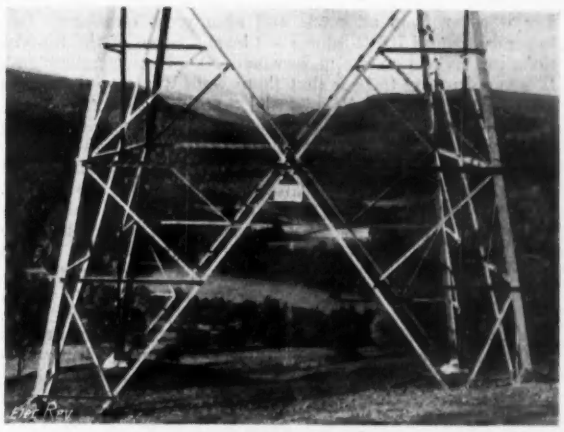
132-kV Lines

From Tummel Bridge the 132-kV lines run in an S.E. direction, generally, to Abernethy, 40 or so miles distant, where they terminate at the company's sub-station adjacent to the grid "sub." The masts are of galvanised-steel lattice construction, with complete continuity of steel, similar to those of the grid, but those between Rannoch and Tummel are heavier to carry the extra circuits. The normal four-circuit masts are 97 ft. high, but in special cases extensions of 10 and 20 ft. are employed at the feet to prevent uplift and to provide for ground clearance.

For extensions of under 10 ft. single-leg extension pieces are incorporated in the structures, while to provide for uneven ground levels on steep transverse slopes, in special cases, side-hill frames have been used. The frames are of triangular shape with one side corresponding to the contour of the ground. At the base of the largest the spread is about 40 ft. square, and in this case one side of the mast measures 122 ft. from tip to ground level, and the corresponding measurement for the other side is 87 ft.

The towers are fitted with anti-climbing obstacles with padlocked gates at the step-bolted legs. All masts with concrete foundations are connected to cast-iron earth pipes, and phase, property number and danger plates complete the equipment in every case. Messrs. Milliken Bros. supplied the heavy masts for the four-circuit line, while those for the Tummel-Abernethy line were supplied by Messrs. A. J. Main & Co., Ltd.

The normal span is 300 yd. and the longest 500 yd. The towers on either side of the longer spans are of heavier construction and the conductors are anchored to the frameworks. Steel-cored aluminium conductors are employed—37/0.110 in.—30 strands of aluminium and seven of steel. The conductors were supplied by British Insulated Cables, Ltd. The



A severe span drop

earth wire, also a B.I. product, is of 19/0.110 in.—twelve aluminium and seven steel. "Hewlett" insulators supplied by Bullers, Ltd., are employed, and the sheds are interlinked with U bolts, so that in the event of an insulation breakage the line cannot fall.

The insulators are of 12-shed construction owing to the rigorous climatic conditions. To all angle towers where the conductors are more than three degrees out of line the conductors are shackled, the jumpers being underslung.

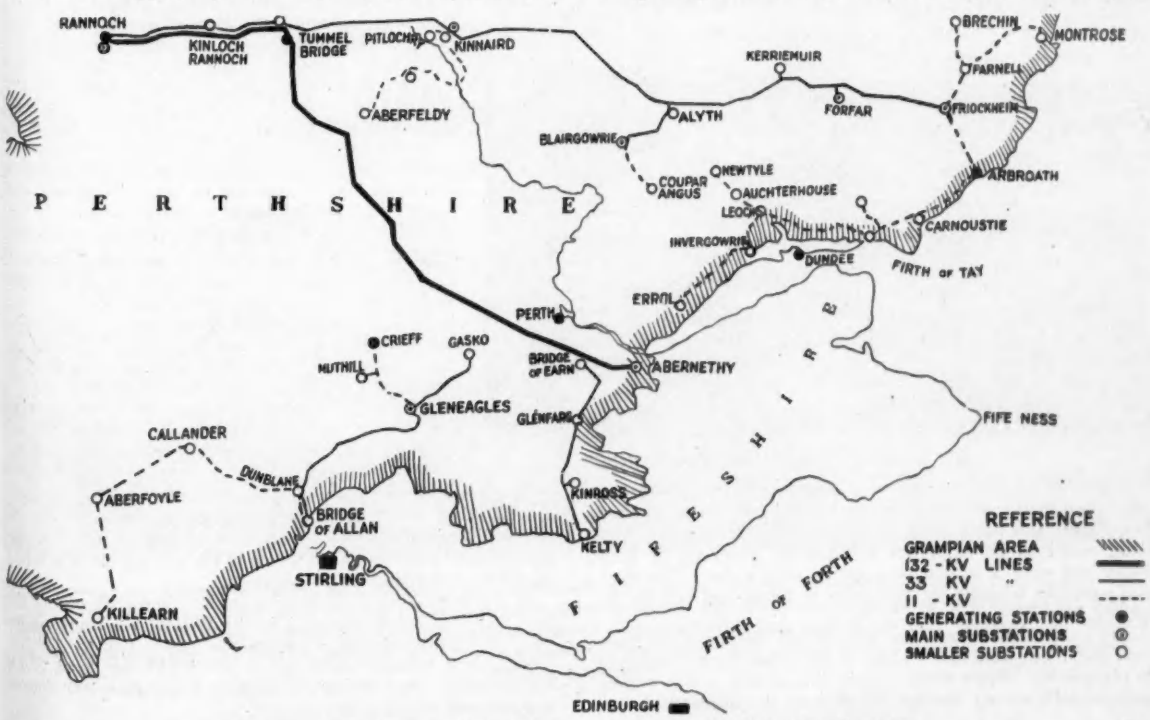
Cone connectors (S.T.) are used for joints in the jumper wires, and "Pairard" connectors for actual line joints. Both types of connectors were supplied by the British Aluminium Co., Ltd. Arcing horns and rings are fitted at all the masts with a normal gap setting of 45 in. At either end of the line over about six spans the gap setting is progressively reduced to about 39 in. to afford a degree of protection to the sub-station equipment. Lightning arresters are not employed.

In the section from Rannoch to Tummel there are three transposition towers at shackling points, both the 132- and 33-kV lines being transposed in each case. A great deal of time and work were involved at these points to obtain the necessary clearances. There are transpositions also at three masts between Tummel and Abernethy.

Construction Difficulties

A word must be said of the difficulties met with during construction. The line between the two generating stations is erected on severe gradients, in many cases as much as one in one and at distances up to 1,000 ft. from the foot of the slope. This resulted in great troubles in getting the materials to the mast sites, and in several places rock had to be removed by blasting to make clearances for hauling.

In a section above Aberfeldy, in the district known as Urlar Moor, which was constructed in winter with snow on the ground, access had to be obtained from either end as the



Map showing skeleton of the transmission system of the Grampian Company

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line is away from all roads and at a great elevation. One tower is about 1,700 ft. above sea level. Some of the foundations in this section are in rock and others are in marshland. It was surprising to hear that there were wayleave difficulties in such a "no man's land."

To reduce the cartage of materials such as cement to a minimum, as many earth-grillage sites as possible were selected. It was impossible to get materials to some of the sites except by man handling, because of the boggy nature of the ground. Morris six-wheeler lorries were the main form of transport—horses got bogged. Where the lorries could not get to the sites, sledges were used. Something like 10,000 trees had to be felled on one estate along the route of the four-circuit line.

In construction the conductors were first run through snatch blocks, with aluminium rollers, suspended from the mast arms, and then transferred to the insulators. It was necessary to establish camps to accommodate the workmen during construction, and the company provided beds and a cook free.

The contract for the whole line was arranged in two sections: Rannoch to Amulree, controlled from Pitlochry; and Amulree to Abernethy, controlled from Perth. Work was commenced at the extreme ends during the winter of 1929, and the complete line was put in commission at the end of November, 1930, after being pressure tested at 150 kV by Callender's Cable and Construction Co., Ltd. Prior to the commencement of the work the necessary survey was conducted and the wayleaves arranged by Messrs. Balfour, Beatty & Co.

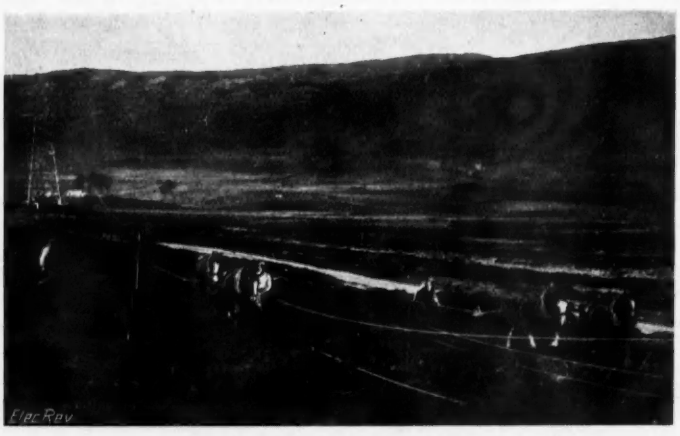
It would be difficult to over-praise the completed job on the grounds of appearance. The lines run through some of Scotland's most beautiful country, and they certainly in no way mar any of the wonderful views; indeed, the engineering mind could be excused readily for claiming that the beauty of the countryside has been enhanced, for there is certainly something majestic about many of the structures arising from the rugged hillsides.

33-kV Transmission

The conductors for the 33-kV lines, also of B.I. manufacture, and of steel-cored aluminium, consist of 16 strands—9/0.152 aluminium and 7/0.097 steel—on the four-circuit section, and 13 strands—6/0.186 aluminium and 7/0.062 steel—on the wood poles. The earth wire on the H poles is 7/0.110 s.c.a. The insulators are of the same make and of similar construction to those of the 132-kV lines, except that they have three discs only. Shackling is also employed at angle masts which are over three degrees out of line.

Owing to the design of the cross-arms on the four-circuit masts steadying insulators suspended from the steelwork are used to support the jumpers. Gap-type lightning arresters supplied by the Metropolitan-Vickers Electrical Co., Ltd., are employed at certain points.

From Tummel the two circuits are carried on wood H poles, following the Strath Tummel Road, to a crossing over the River Garry, the main Inverness Road and the Highland Railway. For this crossing, owing to long spans and risk of land slides, five special steel towers are used. They are of Eiffel Tower construction, 95 ft. high, and carry the circuits up the side of Craigower from the top of which wood H poles again



Running out main-line conductors

bear the conductors over moorlands to Gatehouse sub-station.

The line then crosses very exposed moorland, subject to very heavy gales and snow storms. During erection in this section sledges had to be employed for hauling materials in from either end over a stretch of eight or nine miles. The work was excellent training for that later to be carried out on the 132-kV lines.

The excavations were of a very varied character—in rock, peat bogs, &c.—and under some of the poles it was necessary to place rafts. Every tenth pole in this section is side stayed, and specially strong binders are used on the insulators.

The normal span for the H-pole line is 80 yd., and the normal pole height above ground is 28½ ft. (6 ft. below ground). The route continues over the Kirkmichael-Blairgowrie and Braemar roads to Alyth, where it crosses the River Isla in Forfarshire (Angus), and on over arable land to Friockheim *via* Kirriemuir and Forfar. At Friockheim there is a large sub- and switching station from which the line is continued to Arbroath on the coast at 11 kV, linking up with the company's steam station in the town.

This last section of the line is essentially a part of the main line, the reduced voltage being the result of an effort to avoid salt-spray difficulties on the insulators. There are some perfectly straight stretches on the 33-kV line, in one case for three miles. Every fifth pole is earthed, and a common earth wire is carried above the six conductors.

Sinking an earth grillage

The Tummel-Arbroath line is 64 miles long. Work on the part west of Alyth was started in October, 1928, before which work on certain eastern sections had been commenced. The line is tapped at various points along the route, and with one exception, Alyth to Blairgowrie and Coupar Angus (33 kV), the branch lines are all operated at 11,000 V. The Alyth-Blairgowrie 33-kV, three-wire transmission line will ultimately be extended to Perth or Abernethy.

A 33-kV line from Bridge of Allan to Auchterarder, in the south of the company's area, deals with a bulk supply received from the Scottish Central Electric Power Co. It will eventually be extended to Abernethy or Perth. A similar line from Keltybridge to Bridge of Earn, which will also be extended to Perth or Abernethy, receives in the meantime a supply from the Fife Electric Power Co.

Another line runs from Kingussie to Newtonmore. To afford a supply in bulk to the Fife Co. at Cupar, indirectly for the Central Electricity Board, a 33-kV line is to be constructed from Abernethy to Cupar.

The Main Sub-stations

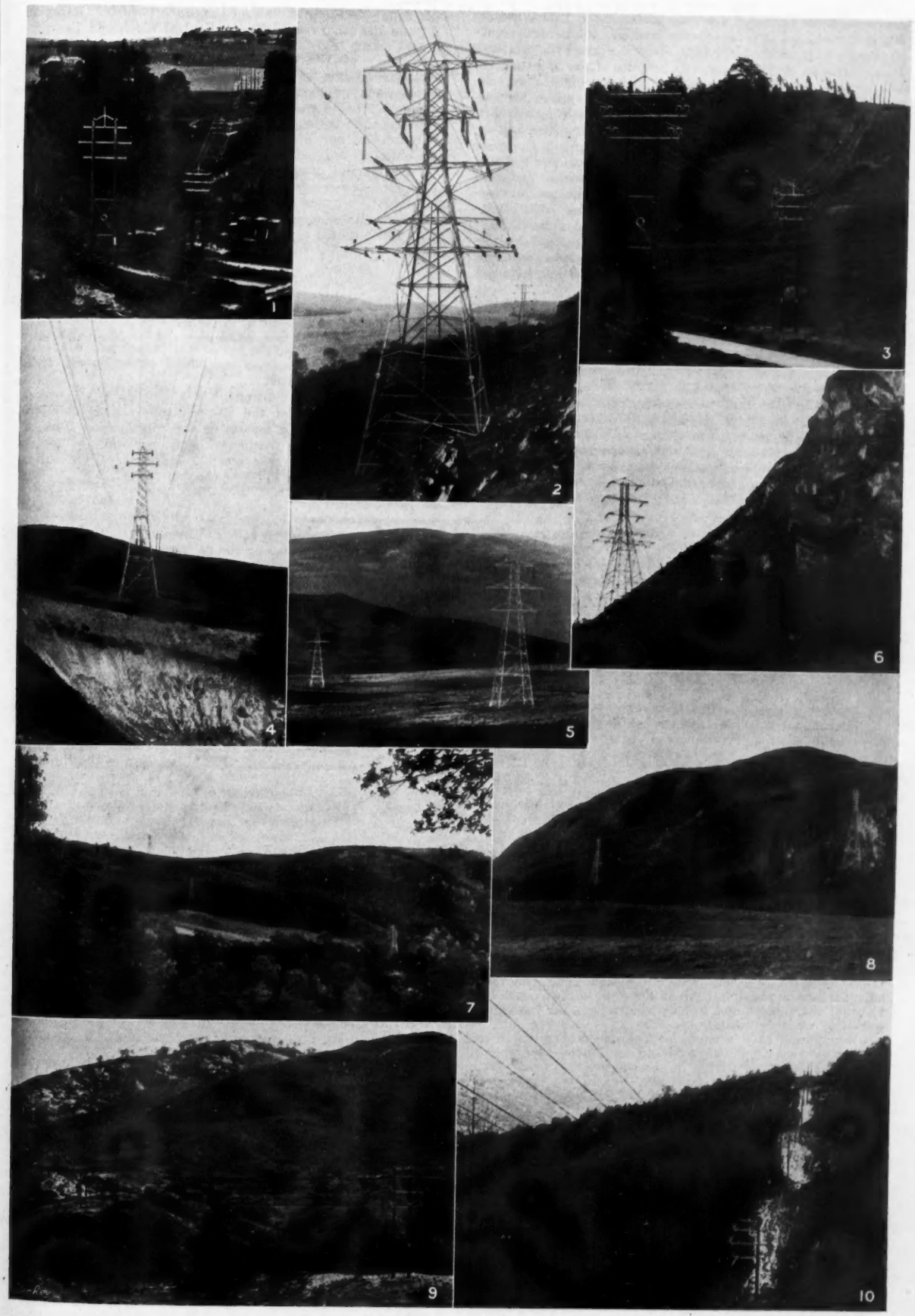
The main 132- and 33-kV trunk circuits receive their supplies from outdoor sub-stations adjacent to the Rannoch power house. These are of simple reinforced-concrete framework construction. In the 132-kV "sub" there are two B.T.-H. step-up, oil-insulated, water-cooled transformers, 11 to 132 kV. They are wound mesh on the l.p. and star on the h.p. sides. The neutral is earthed through resistance.

A booster transformer with on-load tap-changing arrangements is also connected in each line in series with the main transformer. A rotating-pole cross-over switch serves for changing over the circuits from one pole to another. A tilting-post isolation switch, operated by levers from the ground level, is fitted on each of the incoming and outgoing sides of the transformers. At present ordinary switching operations are carried out in the power house at 11,000 V, but provision is made for oil switches which may be required in the future. Earthing switches are provided for use when men are working on the line.

In the 33-kV sub-station there are two 5,000-kVA, 11/33-kV Hackbridge transformers. They are fitted with tertiary windings to afford a 2,200-V supply back to the power house for the auxiliaries. Each of these main transformers is arranged for on-load tap changing, and is fitted with a neutral earth resistance. Isenthal air-break line switches are electrically and remotely operated from the power house. An earthing switch is interlocked with each main switch, so that the former cannot be closed in on a live line.

There is a rail track into each sub-station and between the "subs" and the power house, so that the station crane can be used for hauling the transformers from the sub-stations. Ladders and gantries afford access to the equipment, the whole of which is floodlighted at night.

At a similar 132-kV sub-station at the Abernethy end of the line volt-drop is compensated for by 20,000-kVA transformers (B.T.-H.) with almost a one-to-one ratio—125 to 132 kV. These have tertiary windings (5,000 kVA) for local 33-kV transmission, thus saving the cost of a separate transformer tapping and switchgear.



Glimpses of the Grampian Transmission System: (1) Banff Road crossing—33 kV; (2) Four-circuit transposition tower; (3) H-pole road crossing, Alyth to Kirkmichael; (4) End tower of River Garry, &c., crossing—landslide in foreground; (5) Two-circuit 132-kV line between Tummel and Abernethy; (6) Section of four-circuit line—132 and 33 kV; (7) Crossing over main Inverness Road, &c.; (8) Section between Rannoch and Tummel; (9) Long span across River Tummel; (10) Clearance through plantation

Normally both the transformers are in circuit, and they can be operated in parallel. The star point on the 125-kV winding is brought out to a capacitance bushing; the neutral point at Rannoch is earthed through resistance, and any out-of-balance due to earth leakage, etc., results in the operation of a relay and, in turn, the main oil switch. The main oil switches are of the outdoor type and were supplied by the B.T.-H. Co. The star point on the 132-kV side is brought out to current transformers to provide compensation in metering.

The potential for the metering is obtained from the tertiary winding (33 kV), and the compensation provides that the metering potential is always proportional to the pressure on the 132-kV winding. Current for the metering coils is obtained from current transformers in the neutral of the 132-kV winding. The metering arrangements were provided by the B.T.-H. Co. Horizontal cross-over air-break switches supplied by Electric Transmission, Ltd., form an interlink between the two feeders.

Two small 50-kVA Met.-Vick. transformers, 33 kV—440/250 V, provide a supply for the sub-station auxiliaries, and there is also a boosting transformer to maintain a constant potential on the 33-kV bus-bars. Short and simple conductor spans connect with the adjacent five-unit switching station of the Central Electricity Board.

The control of the equipment is effected from a brick building on site from which the circuit breakers are operated. The whole of the control, protection and automatic apparatus is of B.T.-H manufacture, and the automatic features are set so that if one feeder is tripped out the other will automatically be switched in. A separate panel supplied by the Metropolitan Vickers Co. contains two sets of meters, both registering the bulk supply to the grid, one set the property of the Grampian Co., and the other owned by the Central Electricity Board.

Carrier-current Communication

An outstanding feature of interest in connection with the transmission system is the carrier current ("wired wireless") telephony scheme adopted for communication between Rannoch and Abernethy. It is believed to be the only system of its kind in use in this country, and permission for its use was obtained only after it had been proved by experiment that the amount of radiation was so small that it would not affect wireless receivers in the neighbourhood, or the "master" transatlantic wireless receiving station at Cupar.

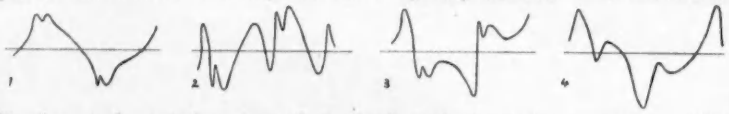
The speech frequency from an ordinary telephone is amplified and connected to the grid of a transmitting valve which controls a wireless transmission circuit, and in this way the voice frequency is superimposed upon a wireless frequency as is done at a broadcasting station. The carrier wave, *i.e.*, the wireless wave, is modulated by the voice and the high-frequency current is passed through a pair of condensers to the 132-kV overhead line, where it is tapped off through the condensers into a receiving set at the other end, where demodulation takes place, the equipment being, in effect, an ordinary wireless receiver.

The high-frequency current has a periodicity of over a thousand times that of the 50-cycle supply and, therefore, there is no difficulty in separating the transmission from the carrier current. The frequency of transmission is approximately 130,500 cycles per second, and that of the calling wave is approximately 81,000 cycles per second.

The Magnetic Analysis of Steel

THE system of analysing steel described in this article depends upon the varying characteristics of a cyclic curve produced by the magnetic properties under the influence of alternating magnetising force. These characteristics are mainly variations in the hysteresis curve of the steel under test, but also have added to them the influence of eddy currents and other features.

The process consists of two magnetising coils having primary windings of the same number of turns and connected in series. In the centre of one coil there is placed a standard bar of steel, of similar section to that to be tested, enclosed in a tubular chamber, through which running water is passed to prevent the solid bar becoming overheated by eddy currents.



The bars to be tested are passed slowly through the centre of the other coil by means of a motor-driven feed mechanism, the current to the coils being automatically disconnected before the end of the rod is reached.

There is a secondary search coil inside of each of the main coils which can be changed to suit the size and shape of the bar to be tested. These coils are connected in series, but in the opposite sense to the primary coils so that the induced currents tend to neutralise each other. The secondary coils are connected to the galvanometer of an oscillograph of the visible type showing the cyclic curve upon a screen. A suitable adjustable rheostat enables the operator to control the value of the current and to keep the curve upon the viewing screen of readable dimensions.

Given similar rods of equal magnetic characteristics in each coil, no current would be produced in the secondary circuit, so that the magnetic curve in the oscillograph would flatten completely out upon the base line, but in practice there is always some small current flowing due to a difference between the two rods.

Owing to the differential connection of the two secondary windings any distortion visible upon the viewing screen is due to the varying rate of change in the two samples under test, the varying conductivity of the circulating eddy currents, or their complete or partial stoppage by reason of the presence of cracks or flaws in the metal. Neglecting the eddy current and assuming the bars to be of similar specific resistance and free from flaws, any distortion will be due to variation in the hysteresis loops of the two steels. If the two loops do not follow the same contour upon both sides, each change will throw up a kink in the curve, which may augment or diminish any existing cyclic curve. These kinks, denoting rate of change, may be of such magnitude that they even reverse the curve upon the opposite side of the base line in the same half cycle, as the illustrations will show.

Eddy current changes or physical defects tend to increase the differential current and cause the curve to grow in amplitude. This may be counteracted by the insertion of resistance which keeps the curve upon the scale. The value of the resistance must be considered as a correction factor and taken into account. One operator continuously views the curve, the shape of which he soon becomes accustomed to when sound metal is under inspection, and he can formulate the amount of tolerance permissible.

Fig. 1 shows the characteristic curve produced when comparing two similar mild steel rods having the following analysis: carbon, 0.08-0.16; manganese, 0.60-0.80; phosphorus 0.09-0.13; and sulphur, 0.075-0.15. The secondary circuit included no resistance, while the primary current was adjusted to 1.5 A.

Fig. 2 shows the curve produced by substituting for one of the rods another having the following analysis: carbon 0.30-0.40; manganese, 1.35-1.65; phosphorus, 0.05; and sulphur, 0.1. Owing to the wide variation in the hysteresis loop, due mainly to the increase in the carbon and manganese contents, certain parts of the curve are even thrown to the opposite side of the base line, while the kinks are increased in size.

A comparison of the mild steel rod in fig. 1 with a rod having the following analysis is made in fig. 3: carbon, 0.10-0.20; manganese, 1.00-1.30; phosphorus, 0.05; and sulphur, 0.08. In this case, although only the manganese content has been increased, the curve compared to fig. 1 has been reversed. But here the size of the kink is more nearly similar to that in fig. 1.

Butt-welded tubes suffer from two main defects: (a) imperfect welding of the seam joint, generally due to underheating of the strip before shaping; and (b) burning of the metal, due to overheating. The curve produced with good tubes correctly formed is shown in fig. 4. While in the coil there will be a circulation of eddy currents round the edge of the tube, but, as they exist equally in the standard and the piece being tested, the effect is neutralised. If one of the butt seams is imperfectly welded, the eddy circulation will be practically stopped, resulting in the formation of a very large differential current, and this curve will be extremely enlarged.

For the same tube where the metal has been burnt parts of the curve (fig. 5) are reversed owing to the increased resistance of the metal caused by innumerable cracks and segregations. It is also possible to identify heat treatment by this process as permeability is directly dependent upon the structure which can be varied by heat treatment.

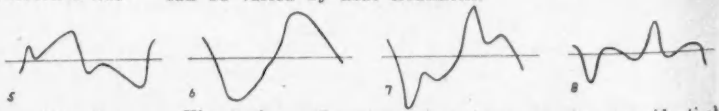


Fig. 6 shows the curve given by comparing two identical specimens, both being cut from the same bar, in the annealed state. Fig. 7 shows the effect of hardening one of the bars. Not only is the curve distorted, but 140 ohms had to be introduced into the secondary circuit to keep the curve upon the screen. The effect of subsequent tempering is shown in fig. 8, where the quenched rod has been tempered down to a temperature of 600 deg. F.

Owing to the skin effect of alternating magnetism, the process is at present limited to mild-steel bars up to 2 in. dia. and alloy steels up to 3 in. This method of testing has been developed by the Magnetic Analysis Corporation of New York, and is being worked in Great Britain by the Equipment and Engineering Co., Ltd.

The Business of Electricity Supply. By Protonius

A call for a new departure

THE most remarkable thing about the proposed National Electrical Canvass is that it should be necessary to propose it at all. For the last forty odd years, we, in the electrical industry, have been exploiting a unique commodity. When Omar Khayyam wrote

"I sometimes wonder what the Vintners buy,
One half so precious as the stuff they sell,"

he must have had an eye on the juice of the atom as well as that of the grape.

Other commodities may rival electricity in universality of appeal, but none approaches it in the variety of its applications. Whatever the sellers of gas or oil or coal may pretend, they must, in their hearts, envy the electrical people for the story they have to tell. All the world is our oyster; nevertheless here we are, one hundred years after Faraday and within a few years of the jubilee of public electricity supply, beating the big drum for so elementary a measure as a house-to-house canvass.

The situation, moreover, is not in the least novel. It may be said to have existed, more or less acutely, ever since the supply industry took shape. While the advance on the technical side has been continuous and general, progress on the commercial side has been slow and sporadic. Year after year the undertakings have been urged to put their business house in order; broadly speaking, however, the result of the prolonged missionary effort of enthusiastic reformers has been deplorably meagre.

It appears worth while, therefore, to examine the reasons for this chronic weakness. Little is gained by merely denouncing the managers of supply undertakings as backward, apathetic, timid, short-sighted, and so on. An entire industry, like a nation, cannot be usefully indicted. If, on the other hand, we can trace the causes of the atrophy of the commercial faculty in electricity supply we have at least prepared the way for removing the trouble.

A Technical Industry

The main peculiarity of the supply industry is that it was founded and managed by technical men. In the general run of cases the financier exploits the inventor; business is the predominant partner. In electricity supply, however, the engineer was supreme because he alone understood the process of generating and distributing his commodity. Electricity was a mystery to the layman, and when it came to organising supply to the public it was the technical mind that not only laid out the stations and the mains, but determined the price at which electricity should be sold, the system of charging, and the methods adopted in selling it.

Under normal conditions the lay element might have extended its range of control, but the conditions were not normal. Legislative difficulties and controversies about private enterprise and public ownership absorbed the spare energies of directors who might otherwise have had sufficient leisure to realise that the essential purpose of their concern was to sell electricity.

The supply section of the industry was not the only one in which the technical mind was the prime mover. The early electrical manufacturing concerns displayed a similar condition. Nothing was spared in the direction of design and production, but the marketing of the product was treated as quite a secondary affair, capable of being carried out by men of moderate brains at a still more moderate remuneration. Many years passed before the correct balance between the technical and the commercial sides was arranged, and there may be cases even to-day where "Sales and Publicity" are regarded as a Cinderella for whom no Prince will ever arrive.

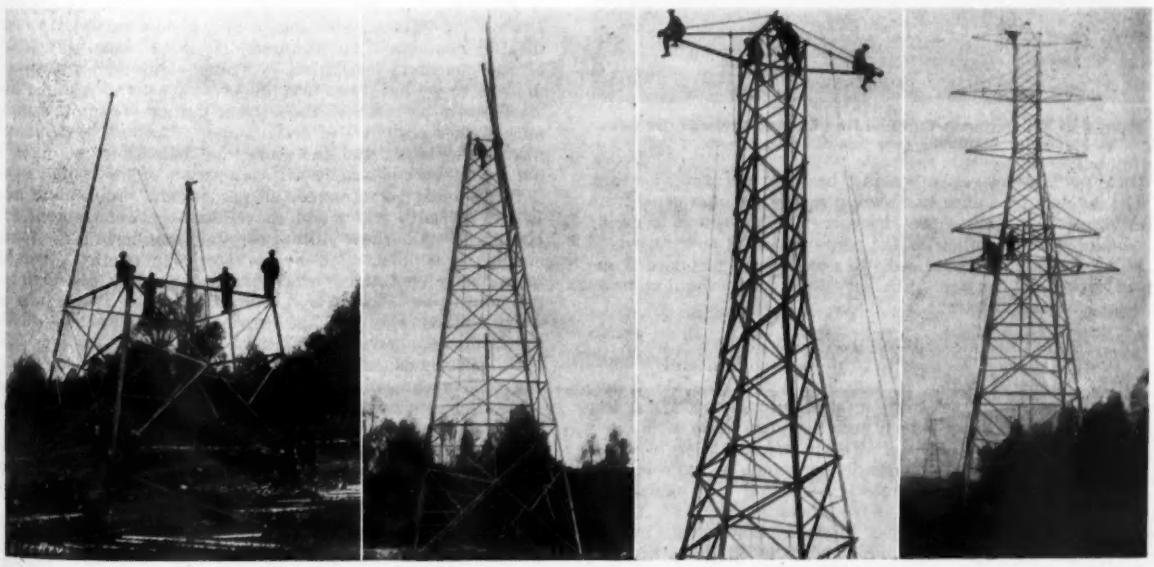
Is Salesmanship Undignified?

In the early days of electricity supply, "Sales and Publicity" had not so much as the position of a Cinderella—they virtually did not exist. Only rarely, very rarely, did an undertaking indulge in anything that could be called a business-getting campaign. It is significant that the pioneering work in systematic commercial development for electricity supply was done by a non-technical man. While the industry was yet young, the late Mr. George Offor circulated testimonials regarding the advantages of electricity over gas. No better publicity material was available at the time, and one might have expected to see it used regularly by every undertaking. But although it was an "obvious" method and produced good results, especially when followed up by a personal canvass, its application remained an exception. The mental attitude of those in authority was that "touting for business" was undignified.

We have, it is true, evolved beyond this primitive phase, but the technical tradition still shows itself in confusing and incomprehensible tariffs, and in forms of agreement that suggest a grave uncertainty whether the intending consumer really deserves the favour for which he is applying. It shows itself also in the survival of the belief that an engineer alone is capable of managing the business-getting side of electricity supply, or indeed any scheme of electrical publicity. This belief is comparable with the stubborn conviction that the management of a political organisation must be given to a politician. It has no better foundation than the claim that a professor of music is the ideal man to manage a gramophone company.

Each to His Job

Nothing derogatory to the technical mind is implied in the argument that such a mind is unfitted, both by temperament and by training, to go marketing. Technical men are specialists; they begin specialising early, and the more consistently they specialise the more likely are they to be successful. It is really a psychological absurdity to expect a man who has devoted his life to mastering the intricate art of converting the energy of burning coal into electricity to become an expert in the no less intricate art of selling the result of his skill

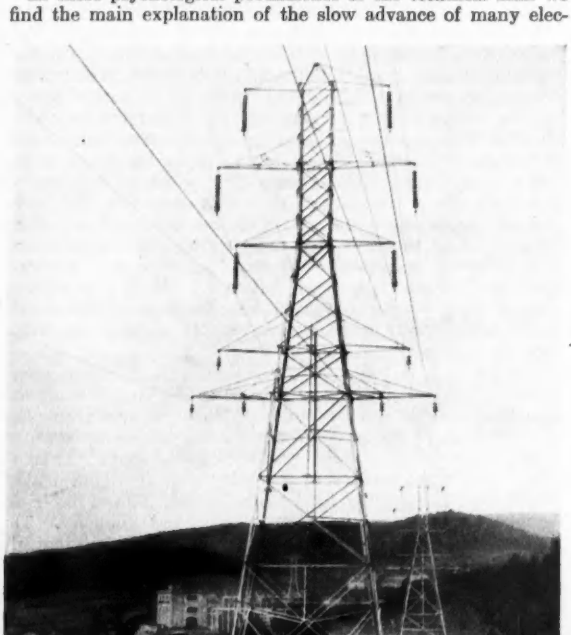


Progressive stages in the construction of transmission towers in the Grampian scheme (*See pp.* 907-910)

to housewives and shopkeepers and factory owners. Here and there we get an exception, but it serves only to prove the rule that technical ability is one thing and commercial aptitude quite another.

We must also bear in mind that the technical outlook is quite different from the commercial outlook. When a technical man is confronted with a new electrical appliance his mind dwells upon its current consumption, its efficiency, its faults in design and construction. He is inevitably critical, and he will reject the appliance if it does not come up to his own rigid standard of economy, safety, and reliability. The commercial man, on the other hand, merely considers whether it is a saleable article, in the sense of being acceptable to the people who will use it. He does not consider whether it is scientifically perfect, but simply whether he can "put it over." Thus, while the engineer is inclined to make the best the enemy of the good, the commercial man makes the best of the good—if he thinks it good enough.

In these psychological peculiarities of the technical man we find the main explanation of the slow advance of many electrical applications—as in cooking, heating, and water heating. The greatest resistance to electrical innovations has come from electrical men, and as they have been in a position to decide whether a novel outlet for the consumption of current should be encouraged or suppressed, we need not be surprised if the early stages of various "auxiliary uses" now familiar to us were long and arduous.



Section of the Rannoch-Tummel line looking towards the power house (*See pp.* 907-910)

Public Ownership Not to Blame

There is, indeed, no need to turn—as is so frequently done—to the municipal system of control to account for the feebleness of the commercial spirit in electricity supply. It is true that public ownership, which puts the supervision of business undertakings in the hands of all sorts and conditions of people and involves frequent changes in personnel, is not conducive to efficiency or progressiveness. But—and the explanation lies in the reasons given above—there is not such a vast difference in electrical business enterprise between the average company and the average municipality as might be expected on general grounds.

The one group has been managed by technical men and haphazard committees; the other by technical men and directors who in the majority of cases were financiers first and sales organisers a long way second. If, on the one hand, we can point to companies which display the highest standard of commercial enterprise, we can also mention municipal undertakings where, thanks to exceptional engineers and chairmen, the consumer is magnificently served. On the whole, however, both groups lie under the same charge of playing for safety and being content with a mythical "normal rate of progress."

Since the causes are so deep-rooted, we cannot expect a swift and universal cure. If we lived in the age of miracles we might pray for a "revival" under which the men who are case-hardened in the technical tradition would be born again. As things are, however, we can do no more than exercise a reforming pressure where it is most likely to be effective.

There are two directions in which there is a prospect of beneficial results. One is in the organisation of distribution; the other is in the training of electrical engineers.

Whatever may be said against the proposal for creating larger unit areas of distribution, no one can deny that the escape from local boundaries will broaden the vision of the people responsible for development policy. A man in charge of a single area may jog along comfortably with no policy worthy of the name, so long as he satisfies his committee. A man, on the other hand, who controls the destinies of twenty areas must plan in a systematic fashion and can do no less than attempt to bring the nineteen backward undertakings up to the level of the active twentieth.

As he must delegate the carrying out of his scheme to managers in each area or convenient group of areas, the suggested reorganisation also provides opportunities for employing, in commercial directions, men who have been displaced by the interlinking of stations and the development of the Grid. Such men will, by acting under a centralised direction as to general policy in the matter of tariffs and business development, enjoy much better conditions than when employed by a local committee which sees little beyond the parish boundaries.

Education in Selling Methods

The training of engineers is an even more important matter. Although we need commercial engineers, we are making no organised effort to produce them. The curriculum through which young men associated with electricity supply are expected to pass is essentially the same as in the earlier days of the industry. We put them through a rigidly specialised course of training, both theoretical and practical; and if they are drafted to the commercial side of an undertaking we expect them to pick up the additional information and experience that they require as best they can in their daily work.

Clearly this is a most unsatisfactory arrangement. The industry must recognise that in future it will need perhaps more trained commercial engineers than those engaged in the actual running and maintenance of plant for generation, transmission and distribution. It must do on the business side what Faraday House and other institutions were founded to do on the technical side when the industry was young.

It is not difficult to outline the course of training required for a man who will be capable of managing a supply undertaking—as a *supply* undertaking—with confidence and vision. A knowledge of the elements of electrical and mechanical engineering is enough to enable him to understand the technical foundations of the business. He should learn the history of the industry—legislative, economic, and administrative—in order to get his duties into proper perspective. An intensive study must be made of the various current-consuming appliances—their principles of design, their economic, hygienic and other advantages, and the scope that exists for their use in our industries and among various sections of the community.

Tariffs must be mastered, along with the problems of load factor, diversity factor and the relation between output and cheapness. All these technical and semi-technical studies should be supplemented by a knowledge of the principles of publicity; not those which are expressed in platitudinous generalities but those which will guide in the efficient use of every method of appeal—the Press, posters, pamphlets, exhibitions, showrooms, circular letters, canvassing, and so on.

No existing educational body appears to be capable of covering such a curriculum, but there is no reason why existing institutions should not extend their courses of study to provide supply managers with the necessary training. Possibly in the initial stages it would not be feasible to go further than to arrange instruction by correspondence, supplemented by special intensive courses of lectures. Whatever arrangements are made, they should lead up to the granting of a diploma.

Clearly there is scope here for co-operation between the Institution of Electrical Engineers or the Electrical Development Association and the educational authorities. If these authorities were made to realise the demand for a new form of specialised training, they would undoubtedly respond; and the demand could be emphasised by the granting of scholarships and financial assistance of other sorts to encourage young supply engineers to work for a diploma which would indicate at least their general fitness for the management of supply undertakings.

However opinions may differ on this specific proposal, it is almost beyond dispute that we shall never get the true business spirit into electricity supply so long as the only organised education we provide is of a technical character. What we have been doing is to train men for one career and grumble at them because they do not succeed in another. No better proof of the strength of the technical tradition could be given than the fact that we did not long ago challenge so grossly inefficient a system.

Contractors' Records. By H. R. Taunton

Guarding against wasted time and effort

A METHOD of storing correspondence and other records which shall be comprehensive, inherently accurate, and easily handled is an essential to any business, but doubly so to that of a contractor, who, from the very nature of his work, is constantly referring to his files. In his case, moreover, the problem of designing an efficient system is complicated by the fact that it is not simply a question of filing Brown's letters under "B" and White's under "W," or under any other straightforward classification, numerical, geographical or chronological.

In any contracting business—here, of course, we are dealing particularly with that of the electrical contractor—the essential feature is *contracts*. Classification by contracts must be the key-note of any filing methods adapted to his needs. In effect, he must have not one general system covering the whole of his business, but a large number of individual systems, each following a definite classification and complete in itself.

Any method of filing has to deal with documents both coming in and going out, represented in the latter case by copies. It will clarify the problem if we survey the possible contents of the mail-bag and make some attempt to tabulate them. The incoming mail consists of :—

(*a*) Inquiries; (*b*) Orders; (*c*) Customers' letters; (*d*) Trade quotations,; (*e*) Trade letters; (*f*) Workmen's reports, &c.; (*g*) Interdepartmental notes; (*h*) Administration letters; (*i*) Accounts and payments in; (*j*) Letters re accounts; and (*k*) Advertising matter.

Similarly, the outgoing mail consists of :—

(*a*) Letters re inquiries; (*b*) Tenders and estimates; (*c*) Letters to customers; (*d*) Inquiries to trade; (*e*) Letters to trade; (*f*) Letters to workmen; (*g*) Interdepartmental notes; (*h*) Administration letters; (*i*) Accounts and payments out; (*j*) Letters re accounts; and (*k*) Advertising matter.

The various sections of the outgoing mail, it will be seen, correspond generally with the similarly indexed sections of the incoming.

Drawings and Telegrams

There will also be drawings, plans, dimensioned diagrams, and the like matter coming in and going out. They may be considered as illustrative to the various sections enumerated, mostly *a*, *b*, *c*, and *d*. The bulkier of them, those of more than quarto or folio size, or which cannot at least be folded easily into those sizes, are clearly not amenable to any ordinary letter-filing system. Their storage is a matter of drawing-office organisation and need not be described here. A list of them, however, should be kept in the appropriate letter file. The others, the smaller items, will be referred to later, when we deal with the various sections to which they belong.

Finally, to complete this survey of incoming and outgoing matter—which in effect constitutes the raw material of the office organisation—we must include telegrams and telephone calls. The latter are mainly ephemeral, or if they are of importance are confirmed in writing by one side or the other. If for any reason a record is taken at the time of any important message, it can be treated as an interdepartmental note and dealt with accordingly.

Incoming telegrams can be dealt with as letters. Telegrams sent are commonly written in triplicate books, one copy being subsequently posted as confirmation and the other kept in the book as record. That has the defect that there is no copy in the contract or job file, unless the telegram is repeated in a confirmatory letter. A quadruplicate book would allow of a copy being filed in the ordinary way. Alternatively, the telegram can be typed in triplicate on ordinary forms, one copy then being filed.

Dealing with Incoming Letters

All incoming mail should be stamped with at least the date of its receipt. This is a precaution which may prove of importance in cases of dispute, as the original date on a letter, and still less on an invoice or advice note, cannot always be assumed to be that of posting.

A better stamp would be one bearing, in addition to the date of receipt, a space for that of reply and one for a filing reference. This will ensure that no letter which needs reply will be overlooked, and that the correct filing of it is not left to the discretion of the filing clerk. A rough-and-ready way of effecting the same end is simply to cross the letter through with coloured pencil when dealt with, leaving the date of reply to be found by reference to the appropriate file; and to underline or scribble on it any necessary filing reference.

Adequate filing references are obviously essential. The best system will drift into chaos and exasperation if letters find their way into wrong files for lack of them. The filing clerk, usually a junior, cannot be blamed if he or she guesses wrongly when left without the guide which the responsible person who deals with the post can easily supply from intimate knowledge.

Some of the incoming correspondence will, of course, be clearly headed already with the name of the job to which it refers. Much of it, however, will have no such reference, or at best only a repetition of the initials of the dictator and typist of the letter to which it replies. In such cases the required indication must be given to the filing clerk.

Outgoing Correspondence

All outgoing correspondence, of course, will, or at least should, be headed by a job or other filing reference. In some cases it may not be desirable to give this—for instance, in sending out trade inquiries for prices in preparation of a tender. However, the correspondence can still be headed by some code reference, such as the initials of the job being tendered for, with which the clerk can be made acquainted.

[*Alex. Corbett*
Mr. H. R. Taunton

Advertising matter (*k*), whether incoming or outgoing, need not here concern us. It will consist of form letters, circulars, price lists, catalogues, and other miscellaneous literature, and most of it will probably be filed in the waste-paper basket.

Similarly (*i*), in and out, are outside any general filing system. Payments, receipts, accounts, invoices, statements, orders-out, &c., are the business of the accountant and the storekeeper.

Generally, too, letters re accounts (*j*), are the concern of the accountant. Where they are solely concerned with questions of book-keeping, as they usually will be in the case of trade accounts, they will be handled and filed by him. In many cases, however, and particularly with contract accounts, questions of fact arise which have to be dealt with by the engineer or other person responsible for carrying out the job. The correspondence must then be dealt with by him and treated as coming under sections (*c*) or (*e*), in and out. Copies—of the replies at least—should be provided for the accountant.

Filing

Let us assume now that so much of the incoming mail as is not permanently retained by special departments has found its way to the filing basket, together with copies of the outgoing mail. The problem is its final disposal.

The filing of correspondence under section (*a*), in and out, dealing with "inquiries" and their "follow-ups" has already been fully discussed in a previous article.*

We have, therefore, now only to consider sections (*b*) to (*h*), incoming and outgoing. Let us first dispose of (*h*), administration letters: correspondence dealing with the general management of the business. It is easily dealt with by straightforward alphabetical filing, in one or more binders. It may be subdivided under such headings as "Rent," "Rates and Taxes," "Staff," "Advertising," and so on; and there may, of course, be private letters which the principal or manager may want separately filed so that they may be kept under lock and key.

We are left with sections (*b*) to (*g*); and all of them are directly concerned with the remunerative work of the business, either in the form of contracts or of jobbing and maintenance. This suggests at once a two-fold division of the papers. Those dealing with contracts, which will be comparatively numerous for each contract, will need different treatment from those dealing with small jobs and maintenance, for some of which there may be only a dozen or so letters to be filed.

We can choose between two fundamental systems which, for want of better names, we will call the "ideal" and the "practical." There are other systems which are neither one nor the other, such as drawers—one for each contract—or permanent binders arranged in order of date; and even such anachronisms as pigeon-holes and spikes; but we need only mention them to dismiss them.

We will take it for granted, too, that copies of all outgoing matter are in the form of loose carbons. The old-fashioned letter-press book is utterly out of the question for the contractor, who cannot have his letters dealing with a hundred jobs mixed together in no order but that of date.

* "The First Essential": ELEC. REV., December 12th, 1930.

The "Vertical" System

The "ideal" system, lauded by "business organisers," is the vertical-filing system. Followed fully, it involves for each correspondent a separate folder, in which letters and copies are kept loose, the folders being stacked vertically in large drawers and arranged on some definite system, generally alphabetical or numerical, with a card index.

Without a doubt, this is *the* system for businesses with a large number of independent correspondents; *e.g.*, an insurance company. It provides better than any other the first essential of filing: that every paper shall have its place and quickly be found in it. It has the drawbacks of bulk and expense, and, further, that as the papers are usually kept loosely in folders they are apt, if frequently handled, to get misplaced or even mislaid. That defect, however, is common to all filing systems which, having to provide for occasional removal of papers, cannot adopt any permanent form of binding. It can be minimised; and there are folders, for use with vertical-filing, which do, more or less successfully, attempt some form of semi-permanent binding.

If we set out to adapt the vertical-filing system to the special needs of the contractor we find plain sailing, of course, so far as the miscellaneous papers (*h*) are concerned; but we are then confronted with the difficulty of adequately separating the contract and job papers (*b-g*). Ideally, this would involve a drawer for each contract, in which each correspondent would have his individual folder. But the drawers are large ones and, except perhaps in the case of an occasional very large contract, that would involve an impracticable bulk, mostly wasted. A possible alternative would be to divide the drawers into smaller sections. But what are we to do with the numerous small jobs, and the repairing and maintenance jobs? The drawers cannot be subdivided indefinitely, or we might as well have a separate folder for each.

That is, in fact, the practical solution where we are not likely to have more than a score or so of papers relating to one job. But it is a departure from the principle of vertical-filing, which demands for each correspondent a separate folder. That would mean, in the case of a small job, perhaps a dozen folders—which would be absurd.

The multiplicity of folders is, indeed, the weakness of this system for the contractor's correspondence. It is not simply a matter of one folder for each correspondent, but of scores of folders for some of them. Take the case of firms which, as some do, make most of their purchases through one wholesaler. Under this system there would have to be a folder for that wholesaler's correspondence in every contract file, even if we agree not to subdivide the smaller jobs. The same would equally apply to the manufacturers with which a firm commonly dealt, and, in a less degree, to certain architects and consultants for whom it might be carrying out several contracts; also, of course, to workmen's letters and interdepartmental notes.

The system has a further disadvantage. A contractor often has to refer simultaneously to the letters of a number of correspondents; for instance, in collating data in preparing a supplementary estimate. That would involve his handling a number of folders of loose papers, with the risk of misplacing their contents, instead of one large binder in which they were securely held. Loose papers are apt to slither; and when, as in a contractor's office, they are constantly being referred to, it is almost impossible to keep them in their proper places.

A More Suitable Arrangement

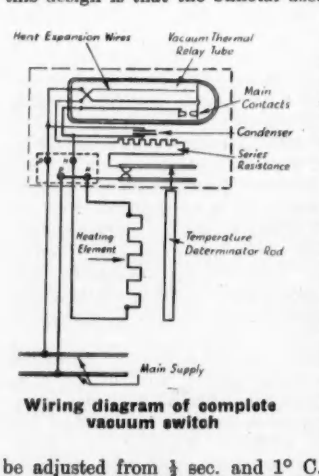
On all these counts the vertical-filing system is unsuited to the contractor's needs. Leaving original cost and upkeep out of the question, he wants a system which, simply and compactly, will allow him to keep together the papers of each of his jobs in such a way that they can be handled repeatedly without risk of loss or misplacement.

Nothing answers more nearly to that specification than the common "arch" file, in which papers, suitably perforated, are secured on metal binding-posts in stout folio cases, with alphabetical guide-sheets. There are numerous types on the market—almost as many as there are stationers—and their general principle is too well known to need description. The papers are firmly held together when the file is not in use; they can easily be turned over without losing their sequence, by a movement of a sliding grip; and, when necessary, they are quickly removed and replaced.

Using a separate binder for each contract of average size, every paper connected with it is permanently kept together in a conveniently handled form, instead of being scattered loosely in a number of folders, drawers, &c. A large contract may require two or more such binders. The alphabetical guides can be divided between the several binders, or it may be found convenient to keep (*b*) and (*c*) letters—correspondence with the customer and his representative—in one, (*d*) and (*e*)—trade correspondence—in another, and workmen's reports, &c., in a third, and so on.

Domestic Apparatus Control

WE have had an opportunity of inspecting examples of the new "Birka" regulator known as the "vacuum wire-type thermal relay." The principal feature of this design is that the bimetal used in the earlier designs has been replaced by resistance wires directly heated by the relay current which causes them to expand, opening or closing the main contacts; these wires are arranged mechanically in parallel and electrically in series.

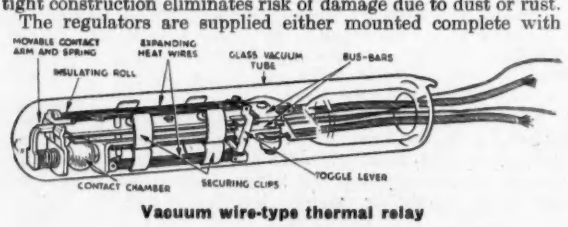


Wiring diagram of complete vacuum switch

Although the wires have a diameter of only 0.3 mm., the current may exceed 60 A at voltages up to 1,000, a.c. or d.c., as in a high vacuum a circuit can be broken without arcing by separating the contacts by less than 1×10^{-3} mm., and the contact pressure required is very slight. The relay current ranges between 30 and 70 mA, while the time and temperature lag can be adjusted from ½ sec. and 1° C. upwards. Every relay is guaranteed for 200,000 makes and breaks.

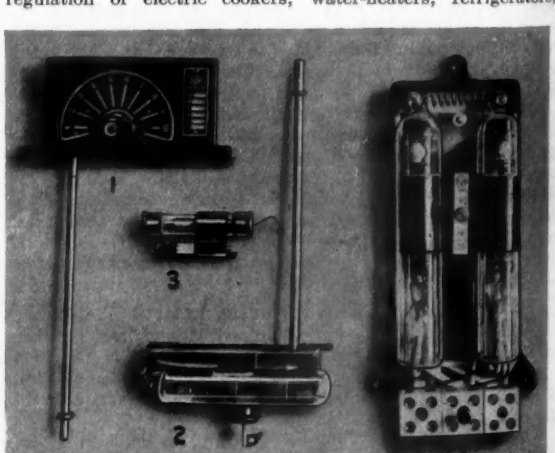
The regulators, which are made in different sizes to suit various requirements, are compact and can be fitted in any position. They are noiseless in operation, and it is claimed that they do not interfere with wireless reception. Their air-tight construction eliminates risk of damage due to dust or rust.

The regulators are supplied either mounted complete with a temperature determinator or fitted in switch boxes for use in conjunction with an independent thermostat or other temperature-sensitive appliance, such as the "Birka" universal temperature determinator.



Vacuum wire-type thermal relay

These regulators find practical application in the temperature regulation of electric cookers, water-heaters, refrigerators,



(1) Oven-temperature regulator with determinator rod. (2) Vacuum cut-out for kettles, saucepans, &c. (3) Adjustable thermostats for water heaters. (4) Regulator switchbox, 16 kW, 400 V.

A range of thermo-electric switches

wash-boilers, kettles (as automatic cut-outs), saucepans (with adjustable temperature controls), irons, hot-plates, time-delay switches, radio sets, &c.

In industry, their uses include the thermal control of annealing and enamelling stoves, electric resistance furnaces, oil and metal baths up to 1,000° C, and many other purposes. A point of especial importance is that the regulators can be used for the control of inductive circuits.

A British Birka Regulator Co. has recently been established to manufacture these devices in this country.

Developments at Tunbridge Wells

New Grid sub-station and works switchgear

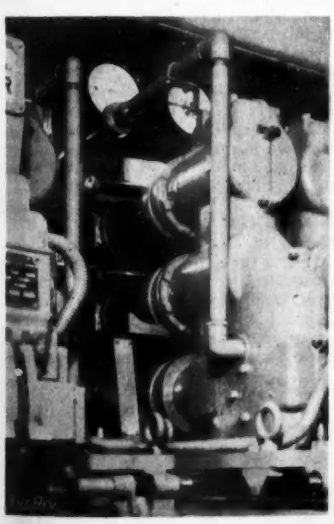
A CEREMONY at Tunbridge Wells yesterday marked important stages in the development of both the S.E. District scheme of the Central Electricity Board and the Tunbridge Wells electricity undertaking. The grid sub-station and new switchgear at the power station were officially inaugurated by the Mayor, Alderman Dennis, J.P.

The grid sub-station is situated at High Brooms, near the power station, and because of the low-lying adjacent ground on the 132-kV incoming-line side it is of the "high" type, following the usual steelwork construction adopted by the Board. The isolators, placed about 60 ft. above ground level, are of the usual air-break type, interlinked with the circuit breakers, &c., and are operated through crank mechanism from the ground level.

From a double-circuit line at the sub-station end there are two 132-kV feeders into the "sub."—one from the grid station at Deptford, *via* a switching station at Northfleet, and the other from Three Bridges; the latter line is not yet completed.

A bus-coupler oil circuit breaker provides for the two 132-kV lines to be connected in parallel. By a hand-operated control switch located on the breaker the latter is set for operation electrically either by a switch in the cubicle attached to the breaker, or by one in the power station. On the h.p. side of each of the two transformers there is a feeder circuit breaker, the operating conditions of which are the same as those for the bus-coupler breaker. The breakers are all oil-immersed and solenoid operated.

The Fuller transformers, 15,000 kVA each, are of the oil-air cooled, star-delta connected type (star on the h.p. side), and have a ratio of 132 to 6.6 Each is equipped with a motor-driven blower for cooling which automatically comes into operation at a predetermined load, the load-selecting equipment being adjustable. On the 6.6-kV side of each transformer is connected an auxiliary transformers, 130-260 kVA, 6,600-400 V. These are wound interconnected star on the h.p. sides and star on the secondaries; and they act as earthing transformers.



Switch contacts partially open

Something of a novelty is an arrangement of potential couplers, a group of which is connected to each 132-kV circuit. These are designed to imitate the line conditions on the 110-V side, and to compensate for any unusual variations of line voltage. All the protective relays, &c., are connected to these couplers, supplied by A. Reyrolle & Co., Ltd.

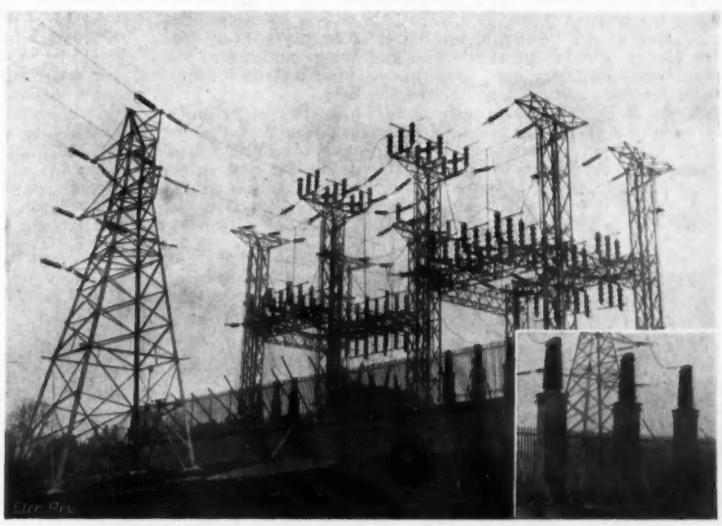
Supply for the breaker operations, indication purposes, &c., is obtained from a D.P. battery in a brick switch house on site. This also contains a 7-kW motor-generator for battery charging, an auxiliary a.c. board with a tap-change supply switch, and a relay panel with ratio-balance, overload and earth-leakage protective gear.

On the 6.6-kV side the transformers are connected to the new switchgear in the power station. The 132- and 6.6-kV switchgear is so interconnected that an earth fault or out-of-balance on any l.p. line will result in operation of the earth-leakage equipment and, in turn, tripping the corresponding 132-kV breaker. In the event of an overload on the 6.6-kV side the overload relay will trip its own 6.6-kV switch only. With the sub-station paralleled up tripping of any of the breakers will automatically trip the others, 132 and 6.6 kV. The English Electric Co., Ltd., was the main contractor for the sub-station. and with a few exceptions it supplied the whole of the electrical equipment proper.

New Works Switchgear

The new power-station switchgear, constructed to the specification of Mr. R. N. Torpy, M.I.E.E., borough electrical engineer, in co-operation with the engineers of the C.E.B., is of the hand-operated horizontal-isolation type supplied by the English Electric Co. There are 12 units, each having a rupturing capacity of 350,000 kVA, the whole being equipped with duplicate bus-bars to which any circuit can be selectively connected by special plugs. The breaker tanks are constructed of heavy boiler plate and were tested to 225 lb. per sq. in. before they left the factory; each tank contains about 50 gal. of oil.

The new board will have connected to it the two largest generating units in the station, which will thus be capable of running in parallel with the grid supply. There have also been transferred from the old works switchboard the two bulk-supply feeders to the Tonbridge Urban District Council and two similar feeders to the Weald Electric Supply Co., but the board will be retained for controlling the local feeders and will be fed from the new equipment. In each of the two cables interconnecting the two switchboards there will be interposed a three-phase bank of English Electric current-limiting oil-immersed, air-core reactors, installed underneath the switch room proper. Each bank is rated at 400 kVA, and is capable of absorbing 250,000 kVA for three seconds in the event of a fault.



Tunbridge Wells Grid sub-station (Inset: Potential couplers)

The rearrangement of the switch room necessitated much care to utilise the available space to the best advantage, and in addition to the new main switchboard in line with the old board, it also contains the remote-control equipment for the grid sub-station and the apparatus for metering the power drawn from the latter by the Tunbridge Wells undertaking. These control and metering panels are mounted opposite the new switchboard in such a position that there is complete supervision of all the apparatus from a central point. A mimic diagram shows the switching conditions at the outdoor sub-station.

Works switchgear and Grid control and metering board

General Development

The power station plant capacity is 12,000 kW, and the maximum load last year was 7,100 kW. The total cost of production in the same period was 0.62d. per kWh. For the last four years the station has been fired entirely with Kent coal which it has been found advisable to treat with steam or water before it is put into the furnace to ensure proper combustion. The fuel has a calorific value of 13,500 B.th.u. per lb., and an 8 per cent. ash content.

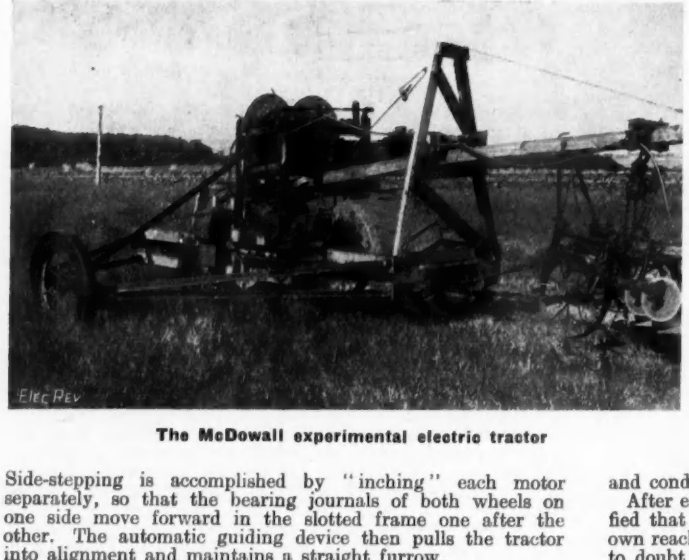
The energy generated last year amounted to 18.4 million kWh, as compared with 14.7 millions in 1930 and 4.8 millions in 1926—a very good record, especially as the load of the undertaking is practically wholly domestic in character.

Tractor Ploughing in Scotland

AT last an electrically hauled plough is being applied to the practical tillage of land on a Scottish farm. This is the first time that such a thing has been attempted on a commercial scale in Great Britain.

An electric tractor is pulling a three-furrow plough with ease through typical East Lothian grey soil on the farm of Major Andrew McDowall, Mungoswells, Drem. It turns a straight-edged furrow, deep and uniform, and the tractor is so easy to control and manœuvre that the man in charge can leave his driving perch and walk behind the machine. Remounting at the headland, the driver stops the tractor, lifts the plough attachment at one end and lowers another at the other end, and then side-steps the machine into new alignment for the return journey across the field.

Major McDowall considers the stables to be the power house of an arable farm. If the aid of electric power is to be enlisted, it must be applied to the mechanisation of tillage operations now performed by horses. Unlike his first caterpillar machine, the present tractor has two broad hollow wheels (not unlike a road roller) independently driven by a motor inside each wheel and geared thereto in the simplest fashion.



The McDowall experimental electric tractor

Side-stepping is accomplished by "inching" each motor separately, so that the bearing journals of both wheels on one side move forward in the slotted frame one after the other. The automatic guiding device then pulls the tractor into alignment and maintains a straight furrow.

Steering is on the sailing ship principle, one of the wheels being slightly biased away from the furrow into which a small bobbin dips and just bears on its vertical face, so keeping the machine parallel.

How Electricity is Supplied

On top of the tractor frame is a chain-driven drum on which the feeder cable coils and uncoils as the plough moves at a right angle towards and away from the overhead power line. One central low-voltage line serves plough land on either side, and the trailing cable is attached to it by a simple pole hook.

The drum tension is small, permitting the cable to rest on the ground without dragging. The ordinary farm transformer feeds the low-voltage line without special gear, since thrashing and other operations do not proceed at the same time as ploughing. Simple fuse protection suffices.

Later in the season, when harrowing the land and for other operations, the tractor would work obliquely from the power line, thus securing the advantages of cross-furrow cultivation. By supplying motors and control gear the General Electric Co., Ltd., is assisting in experiments which one hopes will ultimately benefit the agricultural industry.

The speed of electric tractor ploughing is about 2.5 miles per hour, above which rate any sort of tractor tends to rattle itself to pieces. Major McDowall and his neighbours also use internal-combustion tractors. They contrast the constant availability of electric power and simple switching with the laborious and messy loading-up of fuel and lubricating oil, its transport in semi-darkness to the field of operations, the coaxing of an unwilling set of pistons into activity on a cold morning, choked jets, &c. Electrical machinery is trouble free, has a long life, and needs little skilled attention. Gearing can be simple and robust, there is no clutch or differential, and independent wheel driving minimises slipping.

Cheapness of Construction

Serving a definite purpose, and being on private property, the overhead power line need not be elaborate or cost anything like a public supply line. The present tractor is not an elegant machine; it has been home-built by a practical farmer who does not pretend to be an engineer.

For instance, the outrigger wheel, which is seen attached to the experimental tractor illustrated herewith, has been added to improve stability and is capable of considerable modification. Nevertheless, even in its present somewhat crude form, the machine has proved certain first principles which will result in material simplification. Properly designed on engineering lines, there should be no unsurmountable obstacle to the production of a much lighter machine at a competitive price. The tractor method of tillage is not, moreover, conceived on the expensive lines of large cable-haulage outfits. These, farmers could only afford to make use of on a hiring system, which might not always be convenient or suitable for British methods and conditions.

After eight years of experimenting, Major McDowall is satisfied that he has brought land tillage by electricity within his own reach. His tractor is at work, and anyone who is inclined to doubt its possibilities can go and watch it in operation at Mungoswells Farm, which includes 360 acres of arable land.

The Future of the System

Research into varied phases of stock husbandry and cropping is being endowed. Is not farm power research equally urgent? The need for accelerating the rate at which the C.E.B. transmission grid is likely to be loaded is conceded generally. The Government hopes to encourage the home-growing of wheat, barley, and oats. Such considerations warrant the examination of any means likely to lower tillage costs in this country.

Quasi-optical Telephony

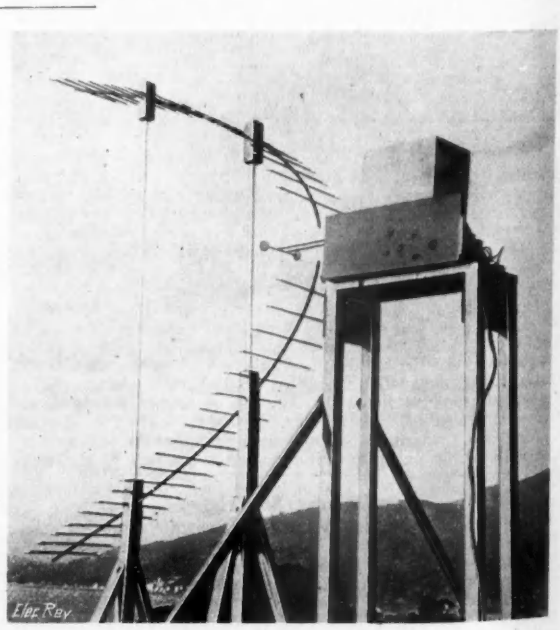
IN the presence of representatives of the Italian Government an official demonstration took place recently in Italy between Santa Margherita Ligure and Levanto, a distance of twenty-five miles, of the new Marconi-quasi-optical ultra-short-wave radio-telephone system, so called because very short wireless waves behave very much like the waves of visible light.

The wavelength used was 50 cm., corresponding to a frequency of 600 million cycles per second, the same as that employed some weeks previously in tests between Santa Margherita Ligure and Sestri Levante over a distance of eleven miles.

During the last few months the Marchese Marconi and his assistants, particularly Mr. G. A. Mathieu, have concentrated their efforts on the commercialisation of the extra-high-frequency method, which they suggest will shortly be used for public services in Italy and may soon afford to the inhabitants of small islands in the Mediterranean Sea reliable means of communication which expense has ruled out so far.

Owing to the simplicity and small power of the short-wave radio system its capital and running costs should be quite moderate; its range is, however, comparatively short, say not more than 100 miles, but the relaying of communications may be found practicable.

The accompanying illustration of a single receiver with short-rod aerial and semi-circular reflector (a quadruple set has four reflectors side by side) shows in what respects the gear differs from that used by the International Telephone and Telegraph Laboratories (Inc.) for their cross-Channel demonstration in April last on a wavelength of 18 cm., as described in our issue of April 10th, 1931 (pages 622-3).



An ultra-short-wave receiver

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

High-voltage Transmission in Italy

THE production of electricity and its transmission at high voltage in Italy are reviewed in the paper which Mr. A. Dalla Verde read at the INSTITUTION OF ELECTRICAL ENGINEERS on December 17th.

The mode of obtaining wayleaves is of interest. Authorisation of the erection of an overhead line or the building of hydro-electric plant is equivalent to constituting it a public utility. The Ministry of Public Utilities cannot refuse consent, but can enforce certain requirements to ensure public safety.

If agreement is not reached with property owners, the Ministry prepares a detailed list of lands and sums due for compensation, which is submitted to the local Prefect, who then authorises occupation of the land. Meanwhile the undertakers deposit the sums due for compensation, disputes about the amounts due being settled in the law courts.

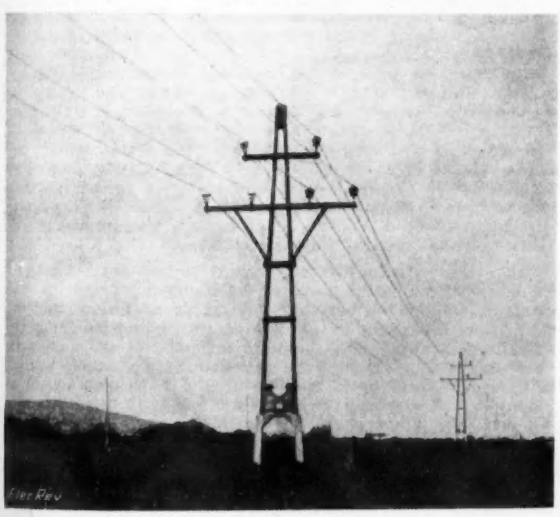
In cases of proved urgency the Ministry can (within one month, confirmed later by regular decree) authorise temporary occupation for two years. The wayleave indemnity varies from 0.5 to 1.0 lira per metre length of line, plus an annual rental for the space occupied by the supports of from 5 to 10 lire for each wood pole and 100 to 200 lire for each steel tower.

EXTENT OF THE INDUSTRY

The principal undertakings are described and statistical data relative to installed generating capacity are given. The demand for power rose from 2,500 to 10,000 million kWh per year between 1914 and 1930, while transmission voltages increased from 60,000 to 200,000 V between 1910 and 1930. The greatest power development has taken place in the North where water-power is available from the Alps. The ratio of water to steam power production is 100 to 3.55.

Contrary to the experience of other countries, where the State has had to promote the construction of interconnecting transmission lines, in Italy it has been done by private enterprise. While frequency standardisation has not been entirely excluded, it has so far been considered too expensive to undertake. Consequently systems are interconnected by frequency-changers and new plant in the north is made to conform to the two frequencies most commonly used, *i.e.*, 42 and 50 cycles; in the south it is 46 cycles.

Amalgamation has resulted in the formation of ten major groups of suppliers, besides which the plants of the State Railways produced over 120 million kWh in 1928 and have several 60- and 125-kV lines. In 1928 the total route length of e.h.p. lines was 21,300 km., of which 3,650 km. operated at over 100 kV, and the total circuit length was 29,500 km., of



Concrete poles used in Sardinia

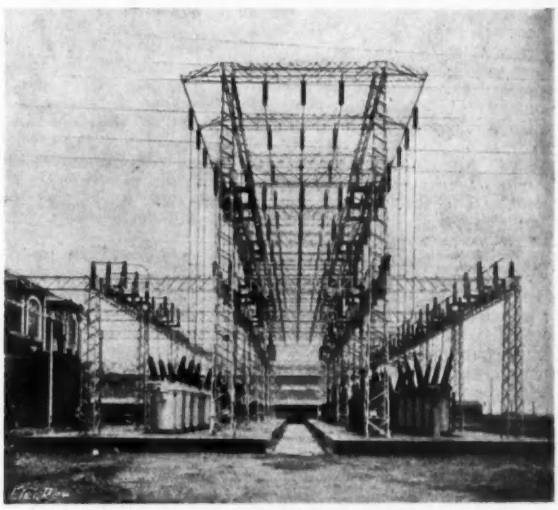
which 4,650 km. operated at over 100 kV; during 1928-30 there was an increase of 20 per cent. In 1928 the sub-station transformer capacity fed by e.h.p. lines was 3,042,000 kVA, of which 403,500 kVA operated at over 100 kV; during the last two years there has been an increase of 20 per cent. in capacity.

PREDOMINANCE OF WATER POWER

At December 31st, 1930, the total installed capacity was 4,684 million kW, 3,880 millions being water power and 768 millions steam. The total production was 10,189,008 million kWh, 9,721,463 millions being water power, 303,475 millions steam, and 164,070 millions imported. In addition private plant is estimated to have produced 1,000 million kWh. It is officially estimated that industry is capable of utilising three times the actual amount of power generated at present.

High-voltage distribution is at 30 and 45 kV and transmission is at 60, 80, 125 (extending greatly), 150, and 200 kV (one 150-mile line of 150,000 kW maximum loading).

The greater number and the most important of the hydro-electric plants have a high head (exceeding 150 ft.). The plant with the greatest head (3,610 ft.) in Europe belongs to the Moncenisio system (Venaus), and the largest Italian power station is at Cardano, on the Isarco, where five 30,000-kW groups (Francis vertical turbines, 252 to 300 r.p.m., 42 to 50 cycles per sec.) and three 10,000-kW groups (Pelton vertical



The Marghera (Italy) 150-kV sub-station

wheels, four or five nozzles, 250 r.p.m., 16⅔ cycles per sec.) are installed, the latter being for railway use.

Plants having a large stream flow and a low head are of less importance. At Mori (on the Adige), 5,000-kW Kaplan turbines are employed, the head being 10.8 m. (35 ft.), the flow 50 m.³ (1,800 cu. ft.) per min., and the speed 150 r.p.m. In Sardinia there are some interesting stations in this class, for example the underground station at Coghinas.

The modern tendency is to install large units; the 40,000-kW vertical groups of the Galleto station exemplify this. Steam stations are designed to serve as reserves and are complementary to the hydraulic resources. The steam pressure is 425 to 500 lb. per sq. in.; the temperature is 660 to 800 deg. F. The capacity of the turbines is between 15,000 and 30,000 kW, with speeds of 1,500 and 3,000 r.p.m., and two or three cylinders are connected in tandem-compound (at Leghorn Ljungström 14,000-kW turbines are installed). The generation voltages commonly used are 6, 8 and 11 kV. There is a slight preference for 3-phase transformers, especially where space may be limited; three-winding transformers are very largely employed at the receiving ends of lines, for use with the synchronous or asynchronous motors which are now being widely adopted for power-factor and voltage control.

OVERHEAD LINE CONSTRUCTION

In general overhead-line towers are of lattice steel type, but reinforced concrete poles, particularly those of the spun type, are coming into wide use. The lattice steel towers for pressures not exceeding 150 kV are generally of the narrow-base type with one foundation block. For the mountainous section of the 200-kV line at Isarco a type of tower with a broad base (25 ft. by 25 ft.) was adopted, with conductors in a horizontal plane with 24 ft. spacing.

Usually the steel members are riveted at the factory and the pole is shipped in sections (20-23 ft.) to conform to the length of the railway trucks. Along mountainous routes, where transport is difficult, and for poles with broad bases, the members are shipped singly and bolted together on site.

Some very important 125-kV lines have reinforced concrete poles with two legs for standard poles and four legs for special crossings. Spun reinforced-concrete poles are coming into great use on account of their price, which is generally lower than that of lattice-steel poles, the smaller amount of ground surface occupied, and the elimination of the expensive protective coating which is absolutely necessary for steel structures. Galvanising has not yet been adopted in Italy on a very large scale, since it is rather expensive.

Copper conductors are most commonly used, but lately steel-cored aluminium has come into use for 125- and 200-V lines, manufactured in Italy of Italian material. Hollow copper conductors, ¾ in. in diameter of 0.24 sq. in. sectional area, have been employed with success on a 150-kV line. The size of conductors has not yet been standardised. So far no vibration trouble has been experienced. Special rules govern the sag at crossings, but not otherwise.

At present opinion is divided about the need for a con-

tinuous earth wire; when used it is on the pole top, and the 200-kV mountain line has two earth wires. Its provision is estimated to increase the line cost by 5 per cent.

Pin-type insulators are no longer used above 45 kV, and there is a growing tendency to discard them even for that voltage. Opinion is also divided regarding protection; those who favour it use arcing horns above 60 kV and rings (at the lower end of the insulator string) for higher voltages.

Several oil-filled underground cables are in use, and 200-kV cables are also on trial.

Long-lived Glass-bulb Rectifiers

"WE have just witnessed an almost violent revolution in converting-plant practice and ideas," said Mr. A. M. Browne at a meeting of the ELECTRICAL POWER ENGINEERS' ASSOCIATION on December 8th.

The mercury-arc rectifier has been making rapid, but steady, progress in this country, and in each successive year it has captured an increasing proportion of the converting-plant market. So far as automatic converting sub-stations are concerned, the author says, "the rotary is dead—long live the rectifier!"

Its good performance, reliability in service, simplicity, and automatic features have taken deep root, far more than may be outwardly apparent; all of a sudden we find all the larger plant manufacturers vying with each other in praising the mercury-arc rectifier. But, whilst rectifiers have been returned to power and find themselves with a rather embarrassing majority in the manufacturing field, this is not to say that the result is unity of ideas. The old question of rotary *versus* rectifier has given place to that of steel *versus* glass-bulb rectifiers.

Up to about six months ago about 90 per cent. of the total capacity of mercury-arc rectifiers installed in this country were of the glass-bulb type, whilst in number of installations the proportion was considerably greater still. Actually there is over 150,000 kW of glass-bulb rectifier equipment in service in this country, and its development to this stage has been unparalleled outside England.

Equipments of any capacity can be made up by grouping a number of bulbs. At present the largest bulbs in use have the following ratings: 425 A at 120 V, 50 kW; 360 A at 250 V, 90 kW; 320 A at 550 V, 175 kW; 200 A at 1,500 V, 300 kW; and 125 A at 3,000 V, 375 kW. These ratings allow for 25 per cent. overload for two hours and refer to one bulb.

STARTING METHODS

To start the plant, instead of rocking the bulb automatically by a solenoid, a flexible auxiliary electrode is controlled through the glass by an electro-magnet placed under it. In this way the electrode is drawn into the mercury pool, completing an electric circuit; at the same time this short-circuits the electro-magnet, the electrode springs back, and thus the ignitive arc is struck. This method is now generally adopted in all British glass-bulb rectifiers.

Bulbs with all their associated gear are generally assembled in sheet-steel cubicles. Two bulbs can quite conveniently be mounted one above the other. With a d.c. output at about 500 V this means that one can accommodate 300 kW on a floor space 3 ft. 4 in. square, or about 30 kW per sq. ft., and it is only necessary to have access to one side of the cubicle.

At first bulbs were developed with three arms for three-phase systems, and two were fed off the six-phase secondary of a transformer. Then four and more bulbs were connected in parallel to the same transformer; also bulbs were later developed with six arms to run six-phase or three-phase, and transformers were developed for 12-phase operation with advantage, so that groups of 4, 6, 8, 10, 16, and 20 bulbs, making up to 2,000-kW banks, came into service. A composite transformer arrangement provides for bulbs to supply into the positive and negative sides and across the outers of a three-wire system, thus leading to a three-wire arrangement at once compact, efficient, and of low cost. Such equipments are quite common in England, and yet no such installation has been made anywhere outside the British Isles. The twelve-phase rectification system generally employed with all traction equipment reduces the d.c. ripple to 0.015 and no interference with telephone circuits has been experienced, though no equipment thus connected has been provided with filter circuits.

SIMPLE CONTROL GEAR

The extreme simplicity of the control gear associated with a rectifier is peculiar to glass-bulb installations, and this is all the more striking when one takes into consideration the fact that in almost every case glass-bulb installations are in non-attended sub-stations.

Out of 100 bulbs put into service up to 1925 in nine different installations, 40 in one, 24 in another, 16, 6, 4, 2, 2, 2 and 2 in others, which have had an average life to date of over seven years, the number of replacements has been three, and many of them may go on operating for many more years. Of 985 units put into service in sub-stations prior to January, 1928, up to November 1st, 1931, the number of replacements was under 15 per cent. The minimum life was nearly four years, and a maximum of about nine years, an average of six years.

The author does not wish to imply that there is no case for the steel rectifier; there is, he says, but only when the capacity becomes large enough for the disparity in initial cost to become so great as to outweigh the advantages of the greater simplicity and reliability of the glass-bulb units. In England this limit has steadily crept up and cannot in any case be regarded as under 2,000 kW.

The Commercial Warming of Buildings

IN the course of a paper which he read before the Scottish Centre of the INSTITUTION OF ELECTRICAL ENGINEERS at Glasgow on December 8th, Mr. R. Grierson expressed the view that the time had arrived for a general and critical review of the possibilities of offering electric energy and electrical heating equipment to the public as a serious commercial alternative to the coal, coke, gas, and oil methods now in general use for the warming of buildings.

If the electrical industry really had a serious commercial electric warming system to put forward, all electrical men should, he thought, be made acquainted with the pros and cons of the situation, so that they might intelligently reply to the queries of their lay friends, and so help forward the general work of electrification.

Investigation of all the data available on the subject had indicated that the industry had every cause for taking a very optimistic view of the future of the electric warming of buildings.

The business was waiting for them. Were they going to accept it and thereby "load the grid" and fill the factories with orders for electrical plant and material, or were they going to sit with folded hands while their competitors got on with the business of heating Great Britain and Ireland?

This paper has been read at other Centres.

Coal and Metal Matters

AT a meeting of the North-Western Section of the INSTITUTE OF FUEL at Manchester, on December 9th, four contributions were presented.

A short anonymous paper records experience of the use of tungsten-molybdenum thermocouples for the measurement of very high temperatures in place of precious metals, which have a very short useful life. The melting point of tungsten is above 3,000 deg. C., and that of molybdenum is about 2,400 deg. C. It is, therefore, not easy to weld properly the junction, but twisting one end of the wire tightly round the other always gave eminently satisfactory results. There was no evidence of any inaccuracy attributable to this rather lax method for making the junction.

The thermo-electric curve is approximately parabolic in shape. The couple has a useful range from 1,200 deg. C. upwards, and the upper limit may be taken as the softening point of the furnace refractory material. At 1,600 deg. C. although the actual e.m.f. developed is small, the power of the couple is more than eight microvolts per degree, comparing favourably with the nine or ten microvolts per degree obtained from a platinum-platinum rhodium thermocouple at high temperatures. The variability of the couple in use was fully tested; there was every reason to believe that it did not vary by more than experimental limits.

It was always found that the portion of the couple exposed to high temperatures in a hydrogen atmosphere became extremely brittle, particularly the tungsten wire, and could not be subsequently cold worked. This meant that a fresh junction had to be made when the wires were handled, involving a loss of a few inches of wire; however, since wire of 0.4 mm. diameter is suitable for the purpose the pecuniary loss is negligible, being, in fact, only a matter of a few pence.

The use of the couple at high temperatures, and particularly in oxidising atmospheres, therefore depends on an adequate protecting sheath. High-grade porcelains are claimed to be impervious to gases up to temperatures of 1,750 deg. C., and in the hands of a careful operator there seems to be no reason why accurate temperature measurements up to this point should not be obtained in combustion atmospheres. With the development of refractories impervious to gases at even higher temperatures, the range of the couple will be increased and should be of value for research and works problems.

COAL SAMPLING

Errors in the sampling of coal from wagons were dealt with by Mr. N. Simpkin, and the Lancashire and Cheshire Coal Research Association. His conclusions are that in the case of dry slacks wagon sampling by the method specified by the British Standards Institution yields results which are incorrect and unreliable, since they would tell against the seller by showing too high an ash content and too much fines.

The only satisfactory method found so far is to sample the fuel by taking increments as the wagons are being filled or emptied during the whole of the unloading period. This is necessary, as the fuel segregates in each wagon, coarse sizes settling at the bottom and sides during loading, the fines tending to be in the middle and on top. This raises the very interesting point of the possibility of loading slack into wagons so that separation of coarse and fines will not occur.

The sampling of dry slacks presents an entirely different problem from that involved in the sampling of more uniform material, such as washed fuels and graded sizes.

IMPURITIES IN STEEL

Non-metallic inclusions in steel were dealt with by Mr. J. C. Booth. The most important are oxides, silicates, and sulphides and little information is available about their effects on the physical properties of steel.

It would be wrong to state that they are harmful in all cases, but steel required for high duty must be reasonably free from them. Free-cutting laminated spring steel and "Aston" metal are examples of their deliberate inclusion.

AUTOMATIC BOILER CONTROL

Another unsigned paper dealt with the automatic remote control of boilers, with remarks on the selection of boiler room electrical apparatus.

The introduction of mechanical stokers with infinitely variable stoker speed gear, pulverised fuel plant, hydraulic couplings on fans and feed pumps and variable inlet vanes on fans has made the automatic and remote operation of boiler auxiliaries by electrical means practicable. It is in effect the conversion of any given gauge movement to an electrical indication, which in turn is converted into electrical impulses which adjust the setting of the auxiliary in question. Obviously such a system has the great advantage of flexibility in operation and, in addition, in the event of trouble being experienced a reversion to hand control may be obtained by the operation of a centrally situated switch.

The usual expensive arrangement of bunkers over the coal hoppers does not appear to be the best arrangement having regard to high building cost and value of space inside the boiler room. Scraper conveyors directly over the hoppers would appear to be a considerable improvement.

How to Improve Domestic Apparatus

AT an informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS which took place on December 7th, Mr. C. F. Mounsdon opened a discussion on "Improving the Reliability of Domestic Electrical Apparatus." He said the subject was not a side issue, but was one of the utmost importance; he knew of several cases in which the greatest dissatisfaction was caused by defects arising from quite trivial and easily preventable causes. The whole industry was concerned that electricity should be a boon to the user and the essential provision was service.

The design of domestic apparatus in the past few years had shown marked improvement, but criticism could not be withheld from some of the apparatus on sale to-day. It was nearly all traceable to the demand for cheapness, but some otherwise admirable gear still showed minor defects in design and at the terminals. It was imperative to meet the small consumer with cheaper and yet cheaper apparatus, but nothing but harm would be achieved if reliability was not made the first consideration.

Mr. F. C. Raphael said there was very little wrong with apparatus for which a fair price was paid, but he agreed with speakers who wished to replace most terminals by porcelain connectors.

Mr. W. L. Wreford said the makers of domestic apparatus were not making sufficient effort to show buyers that better goods were cheaper in the long run. There was too much tendency to make a thing at low cost because it would then be easy to sell it.

Railway Traffic Control

TRAFFIC control and signalling on railways are dealt with on broad lines in the paper which Mr. A. E. Tattersall read at a joint meeting of the INSTITUTION OF CIVIL ENGINEERS (Yorkshire Association) and the North-Midland Centre of the INSTITUTION OF ELECTRICAL ENGINEERS on December 17th.

The author points out that the tendency towards automatic operation is world-wide. By the aid of track-circuiting, and the electrical operation of signals, signal sections may be spaced equally, signals operated automatically, many signal boxes dispensed with and traffic kept moving.

The track-circuit is the basis of modern signalling systems, and in its simplest form may be defined as an electrical circuit, of which the track rails form a part. It may be so arranged that the signal governing the section cannot show clear unless the whole of the section be clear, and should the section become occupied, the signal will be placed at danger and kept in that position so long as any part of the section is occupied.

Thus the human element as represented by the signalman is eliminated. It renders automatic signalling possible and, with it, increased track capacity and a reduction in upkeep. With manual signalling a point may be reached by the creation of additional manual block sections whereby traffic movements are actually retarded, due to the time required to perform the manual functions. Further, the manual system, if at all intensive, is very expensive to maintain.

On the London Underground railways, probably the most efficient service in the world, automatic signalling is installed throughout and the headway in the rush hours is forty-three trains per hour. This should not be regarded as the maximum possible.

CENTRALISED CONTROL

Modern systems of traffic control from a central point are an indispensable adjunct. In order to secure this, the controller should be in telephonic communication with all the signal boxes, stations, &c., in his district, both calling and speaking over the same pair of line wires, selectors being employed at each wayside location, so that only the location desired is called.

A recent development is the use of dial calling in place of the selector key, the operation being exactly similar to that in automatic telephony. A two-digit system is all that is necessary, and the first control system working on this principle has recently been installed at Darlington and is giving satisfactory results.

Why should such a system stop at traffic control? Why not extend it to the signalling system? From an engineering point of view it is quite possible, the only limiting factor being that of expense. At the present time there are numerous installations in use in the United States, and in one case the whole of the signalling over a stretch of about ninety miles is controlled from a central point. In connection with the widening of the main line north of York, now in hand, the interlocking for Thirsk station will control all tracks for a distance 4½ miles, which is easily a record so far as this country is concerned.

There can be no doubt that progress in signalling will materialise in the direction of centralised traffic control, which offers great possibilities as regards economy and efficiency in operation.

COLOUR-LIGHT SIGNALLING

No matter how the signal sections be arranged, maximum track capacity can never be obtained, pending the general adoption of automatic train control, unless colour light signals be employed. Their use is rapidly extending in this country, and they are now being installed over 100 track miles on the L.N.E. Railway, between York and Northallerton. These will employ only one lamp and lens combination, and the various aspects will be given by a movable roundel containing red, yellow, and green lenses, interposed between the lamp and lens, and magnetically controlled. They are also being installed in other countries.

Christmas Lectures

The customary talks and exhibitions arranged by various London institutions for juveniles during the Christmastide holidays include a popular course of afternoon lectures at the ROYAL INSTITUTION by Sir William Bragg, whose general subject will be "The Universe of Light." The series will begin on December 29th with an exposition of the nature of light, and its relation to the eye will be explained in the second lecture on December 31st. Two succeeding discourses on January 2nd and 5th will be devoted to the connection between light and colour. "Light from the Sky" is the subject for January 7th and "Light from the Sun and Stars" is the title of the January 9th lecture.

The Women's Voice

Addressing a large gathering of the members of the Torquay and District branch of the ELECTRICAL ASSOCIATION FOR WOMEN on December 10th, Miss C. Haslett said that women had come into the electrical world and were now definitely recognised. They claimed to be interested not only in the home, but also wanted a voice in the effective lighting of the streets of our towns.

Speaking at the supper and dance of the Plymouth and District branch on the following day, Miss Haslett said they had found that in the average working man's home the working woman spent 70 hours a week in household duties, whereas a 48-hour week was considered sufficient for a man. The object of the Association was to introduce electricity into the working women's homes, so as to considerably lighten labour in them.

The East Devon branch of the Association held a Faraday Celebration dinner on Friday, December 11th, in Exeter, at which Miss V. Holmes, A.M.I.Mech.E., and Principal John Murray, LL.D., were the speakers. Among the guests were the Mayor and Mayoress of Exeter and Mr. Arthur Reed, M.P. for Exeter. A three-day electrical exhibition was opened on December 10th at University College, when Sir Wm. Bragg, O.M., K.C.B., F.R.S., delivered a Faraday lecture.

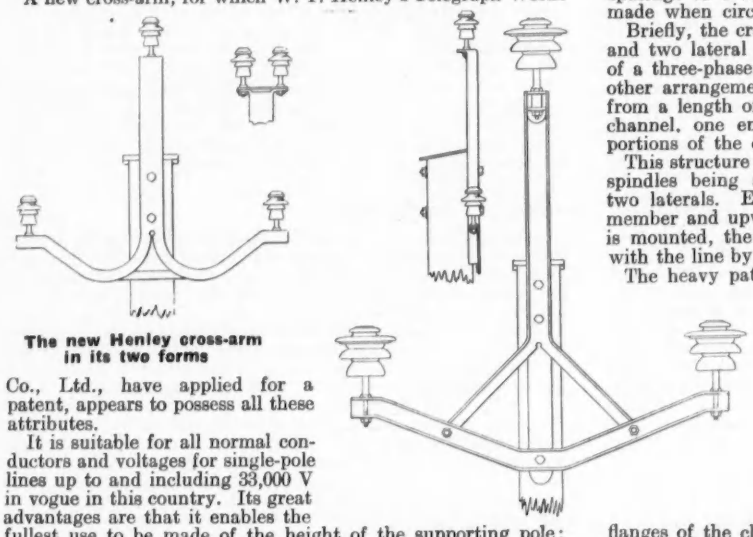
The Supervisor's Legal Position

The legal position governing the conditions of employment of supervising engineers is not always so clearly understood as might be by the employés concerned. The ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS was therefore fortunate in having Mr. C. Nyholm-Shawcross, barrister, as a lecturer on the subject in London on December 15th. The situation was outlined comprehensively, the matters dealt with including service, performance, and breach of service agreements; legal incidents of employment duties; and how the position of supervising engineers is distinguished from that of other professions.

A New Pole-line Cross-arm

WHEN planning high-voltage single-pole overhead lines, ease and rapidity of erection are important considerations, coupled of course with maximum efficiency and minimum expense.

A new cross-arm, for which W. T. Henley's Telegraph Works Co., Ltd., have applied for a patent, appears to possess all these attributes.



The new Henley cross-arm in its two forms

It is suitable for all normal conductors and voltages for single-pole lines up to and including 33,000 V in vogue in this country. Its great advantages are that it enables the fullest use to be made of the height of the supporting pole; no birdguards are necessary; the pole diameter does not affect anything but the length of the fixing bolts; there are no loose parts; adjustments do not have to be made in the field, assembly being completed where necessary before the cross-arm is taken to its position; and the cost is stated to be low.

The device is made in two types: light and heavy. The light pattern is manufactured only in one size, with a spacing of 3 ft. 6 in., and the heavy pattern in three sizes, with spacings of 4 ft., 4 ft. 6 in., and 5 ft., but others can be made when circumstances justify.

Briefly, the cross-arm is a unit structure providing a central and two lateral members for supporting the three conductors of a three-phase transmission line, although it is adaptable to other arrangements. The light pattern arm is manufactured from a length of metal of appropriate cross-section, usually a channel, one end of which is split longitudinally, the two portions of the end being apart to form a pair of side arms.

This structure can be easily bolted on to a pole, the insulator spindles being attached to the central portion and to the two laterals. Each arm slopes downwards from the central member and upwards to the extension on which the insulator is mounted, the slope reducing the likelihood of interference with the line by birds.

The heavy pattern is formed only in part by the split bar, the arms of which are bent outwards and attached to a second member extending outwards and upwards, providing at its centre a further point of attachment to the pole, whilst the insulators occupy the same relative positions as in the light pattern. Where duplicate insulators have to be carried, the same unity and freedom from loose parts is obtained by extending the side arms, splitting the upper end of the vertical member, bending horizontal the two portions so formed, and fitting a top reinforcing plate.

The light pattern can be erected with the flanges of the channel against the pole, so providing a sound means of transferring the wind loading of the line to the support, but the heavy pattern is erected always with the web of the vertical bar against the pole. Both patterns are seen in the illustration.

A Jungle Power Station

SEVENTY-FIVE miles from Bangalore, in Southern India, is the island of Sivasamudram, encircled by two arms of the Cauvery River, on which is the power station supplying Bangalore, Mysore, and Maddur with electricity, thus enabling millions of illiterate Indians to enjoy the advantages of electric light and power at nominal rates.

A few evenings previously to a recent visit to the power station we had watched the lights of Mysore City, where every street is electrically lighted, leap into existence from the summit of the sacred Chamundy Hill, which rises 3,478 ft. from the plains on the outskirts of the city.

At Sivasamudram the Cauvery River drops in a roaring cascade some 500 ft. Until 1924 (when it was swept away in a flood) a curious bridge spanned the northern branch of the river; it measured 250 yd., and was entirely composed of slabs of stone, all of them less than 9 ft. in length.

To-day a solid dam or anicut, as it is called in Southern India, stands in its place. From the northern end of this anicut a canal, which pursues a meandering course of two miles, dictated by the topography of the ground, and ends at the power station bluff, has been constructed. On the way a 50 ft. deep cutting had to be made to traverse a low saddle of the hills, also three weirs each forming a drop of 10 ft.

The intakes of the conduits are situated at the power station bluff. An iron grille and fine metallic gauze cover them and prevent the entrance of any solid substance which might injure the blades of the turbines at the lower end of the conduits. These twelve pipes, varying in diameter from 5 ft. to 9 ft., and running straight down the face of the bluff at a very steep angle, form a striking spectacle in that wild and for the most part jungle region.

Each pipe has its own automatic intake gate, consisting of a small paddle which permits the water to flow at the rate of 10 ft. per sec. Should the speed of the water exceed this figure the rotation of the paddle is accelerated and the gate is automatically closed; whereupon the revolutions of the paddle decrease and the gate opens again.

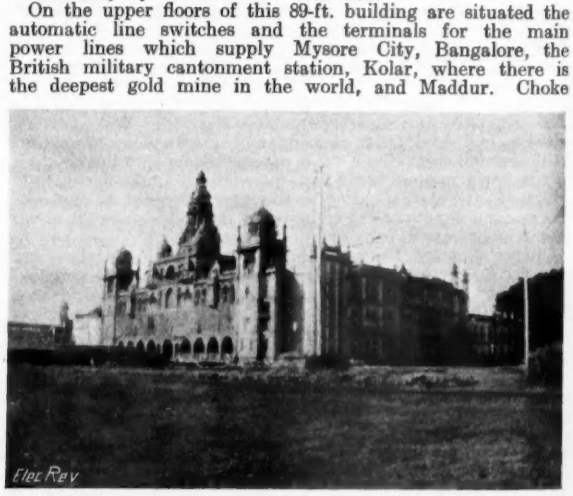
We descended to the lower end of these pipes on a specially constructed trolley which is worked by an electric winch and descends the steep slope almost vertically at a uniform speed. At their lower ends the great pipes are connected through automatic inlet valves to turbines which are directly coupled to the 500-r.p.m. generators.

The noise was deafening. The output of the smallest and oldest of these sets is 2,500 h.p.; the latest set installed develops 9,000 h.p.

In the control room on a panel of the "drawing-desk" type small red and green lamps indicate the machines in use, &c. Apparatus for recording every electrical operation in the station is installed of a kind of which only two examples are to be found in India.

Power from the generators is transformed from 2,500 to 76,000 V. The transformers are oil-filled. There is an arrangement whereby, in the event of the oil igniting, it is immediately ejected into the river bed.

On the upper floors of this 89-ft. building are situated the automatic line switches and the terminals for the main power lines which supply Mysore City, Bangalore, the British military cantonment station, Kolar, where there is the deepest gold mine in the world, and Maddur. Choke coils and elaborate lightning arrestors are provided in separate buildings.



The Maharajah's Palace, Mysore, which is lavishly illuminated at night

This plant has been in operation since 1902, when four units were installed of an aggregate output of 6,000 h.p. Additions have brought the present capacity of the plant to 46,000 h.p., but this will not, I am told, long suffice for the rapidly increasing needs of that go-ahead native state, Mysore.

C. FALCON.

Contractors and Rural Electricity

In the December *Electrical Contractor and Retailer*, Mr. Walter Riggs, past-president of the E.C.A., calls attention to the urgent necessity for contractors in rural supply areas to work together. After pointing to a number of matters in which they could be of mutual assistance, he says: "If this type of business co-operation is *not* undertaken by electrical contractors, then they will be left far behind in the business race. The work will fall into other hands, into the hands of supply engineers who, whether we like it or not, possess the 'employé strength' to depute men to make such specialised studies of each and every section of their widely-spreading business."

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Canvass the Country

The various views expressed in the ELECTRICAL REVIEW on the National Canvass have greatly interested me as one formerly associated with the industry who has been forced by circumstance into other spheres.

Some of Mr. Swale's points appeal to me, but others are too technical. Why should it be thought necessary for a canvasser to be a fully qualified technical man? I can quite understand that specialised knowledge is essential in the industrial branch, where expert must meet expert, but conversation with a householder is quite a different matter.

Your contributors often draw attention to the fact that the average non-user of electricity is rather afraid of the "mysterious servant," and thinks it far too complicated, and even dangerous. This must apply even more so in what is referred to as "rural" electrification.

It seems impossible that the house-to-house canvass has been neglected, and yet it certainly has, to the shame of the trade. Such progress as has been made has been prompted by the wonderful appeal of electricity itself, and not by its human exploiters. The nation is crying out for electricity, properly presented, and the trade—to prove that it really understands its job—replies in volts, watts and amps!

If the nation is to be canvassed let it be done by *canvassers*, or, as some term them, salesmen. Surely the house-to-house street-to-street system is the only logical way. Yet, where has this been done?

The E.D.A. has done good work in inculcating the "electric idea" into the minds of the general public. The only sensible follow-up is a *personal* canvass—house-to-house. How many contractors think they are doing wonderful work if they circularise a few of the élite of the town in an effort to sell an idea in irons or some similar domestic device? This is the worst sort of canvassing—but it is the easiest.

How many contractors think of waking up a demand *during the winter* for installation work during the slack period next summer? None—because they are too busy to worry until the time comes.

The public must be methodically approached. Often a householder wants electricity, but on inquiry he learns that the mains do not pass his house, and it would not pay to run them just to supply him alone, so he must wait until enough people ask for it to make it a paying proposition. In nine cases out of ten the matter drops there.

The fault lies with the contractors. Surely installation work is worth canvassing for. If I were a contractor (electricity department chief is beyond my wildest ambitions) I should first approach the local supply authorities and get information of intended extensions. Since supply authorities only adapt themselves to the demand, perhaps this information would not be forthcoming. I should then put forward a definite proposal, something like this: "If I can get thirty new consumers out of the hundred new houses in Village Road will you extend the main to supply them?" It should be comparatively easy to get the new consumers if a canvasser is employed; the working foreman will not do it, and circulars are a waste of stamps. If an assisted-wiring scheme is in operation the canvassing is half done, and the other half remains to be done either by the supply people or the contractor, as may be arranged.

A conference of the various interested branches of the industry is suggested to thrash out the matter. Such a conference might still be sitting in 1935 and have got no farther. Some enterprising contractor is required to show how it should be done. But, for Heaven's sake, don't send an M.I.E.E. on the canvass. He would only further frighten the cautious housewife. Ohm's Law must be kept in the rear, and "Home's Lore" ever in the van.

A. A. LEE.

Basford, Nottingham, *December 9th*, 1931.

Still the Boiling Plate

In your issue of December 11th Mr. T. N. Veitch accuses the various writers of fighting shy of what is considered a problem, and suggests the use of special utensils, intimating that expecting efficiency without supplying such things is like crying for the moon. He also says that the enclosed plate has come to stay and that the modern design is thoroughly efficient. These rather dogmatic statements require some justification.

Mr. Veitch is thus placing himself in a similar position to the writers he accuses, as providing special utensils is only a half-way measure and similarly avoids the issue. He is on firm ground when advocating the use of flat-bottomed pans, but we cannot expect consumers to use special utensils.

Moreover, plates and pans warp, and unless the bedding is sound the combination is inefficient; it was this that led me to the idea of a plate providing a good thermal bedding.

The modern plate is a much improved device but it sometimes burns out when run without the utensil, due to certain constructional features for which research has not yet provided a solution, but this may not be much longer delayed.

These problems are not so straightforward as many people would have us imagine and they are being too lightly passed over, although cooking and heating matters are of vital importance to the whole of the electrical industry.

Leaving out certain obvious improvements required in the plates themselves, there are two broad lines of attack, comprising different forms or arrangements of heat source, but both involving the heat flow from the point of production to the point of application. In the case of the gas ring the hot gas impinges upon the utensil. We might do the same thing electrically by using say air as a medium and arranging a special element in tubular form, after the style of a gas ring, with similar holes projecting upwards; very little draught would be necessary for this.

The second method is to retain the existing type plate and provide a far better thermal path to the utensil, and where necessary combine this with a similar moving medium. By arranging the ducts in certain ways no damage would be done, however long the utensil was left off.

I evolved these methods when improving "fires," as they enable a combination of the ordinary and reflector systems to be designed on production lines, but new ideas don't seem to arouse much interest. It would be enlightening if other workers in this field would put forward their ideas, avoiding the assumption that present contrivances are perfectly efficient and satisfactory, and that research work can go no farther in certain directions.

Huddersfield, *December 12th*, 1931. CHARLES E. BAXTER.

In your issue of December 11th Mr. Baxter practically answers all the points raised by Mr. Howard the previous week, but he overlooks the fact which the writer of the article also overlooks, that is, the number of places that are still supplied with d.c.

With the best gas hot-plate the efficiency is not more than 50 per cent., whilst with an electric hot-plate this efficiency is only 20 per cent. to 30 per cent., with a possible maximum of 35 per cent.; although with an electric kettle with enclosed elements an efficiency of 80 per cent. to 90 per cent. can be obtained.

Mr. Howard thinks that if I consulted a first-class cook I would alter my opinion of the higher efficiency of the electric oven as compared with the gas, but Mr. Baxter answers this point. The only other point arising is the question of actual cooking. It is usually stated that an electric oven will cook with less loss than a gas oven, but if a joint or other article of food is roasted to the same extent by either electricity or gas, there is no difference in weight, as any loss is entirely due to the evaporation of the water in the food.

Regarding coal and gas combined, it is a recognised practice of the gas companies to use a combination of coke and gas, wherein they put a gas jet underneath a piled up coke fire which not only has a very pleasing appearance but is also, I understand, very efficient. Unfortunately such a combination cannot be adopted with electricity.

London, E.C.1, *December 14th*, 1931. J. MARTIN BLAIR.

Organising Commercial Electrical Men

I have read with interest the letters signed "Protection" and "Commercial" in your issue of November 27th. Your two correspondents strike a different note, "Protection" pleading for a commercial association allied with the Electrical Development Association to deal with local trading conditions, and "Commercial" dealing more with the individual commercial man and his personal position.

It is perhaps with the latter's remarks that I am more interested. He states that the time is ripe for the consolidation of supply personnel—company and municipal alike—in one organisation, and says: "Give us representation on the National Joint Board, and members of the industry will flock to the Association in many thousands." His next sentence is more significant: "In municipal supplies there are very many obstacles to overcome, some cannot be overcome."

The latter sentence expresses the experience of this Association during the fourteen years of its existence. We came into being just after the war, at a time which was certainly considered ripe for organisation, more especially as the technical engineers were making rapid strides in organising themselves in one consolidated body. Furthermore, the National Joint Board had just been formed, and an excellent opportunity was afforded to secure seats upon the Board and attempt to do something to improve the conditions of service of the commercial and clerical workers in municipal and company undertakings. As we were able to start full of promise, and take forward a scheme for standardisation of salaries, we gained thousands of members.

In spite of the fact that we were members of the National Joint Board in 1920, and that a temporary award was granted, with the proviso that a standard grading scheme would be considered at the earliest possible moment, we had no opportunity of enforcing the payment of the award. This was mainly because of the attitude of municipal councils, who refused to agree to their electricity department staffs being treated separately from the staff of other departments. This matter formed the basis of long arguments, and many seceded from the Association. The argument is simply this—Has the

commercial man in a municipal electricity undertaking more in common with the staffs of electricity supply companies, and, therefore, should they all be treated on an industrial basis? Or has he more in common with the staff in other departments of the council's service?

It has been pointed out that a member of the electricity department staff is there by accident; he might easily have been appointed to another department. Furthermore, instances have been quoted where a member of the electricity staff has been transferred to another department, and *vice versa*.

So far did this argument prevail that in 1921 the employers' side of the National Joint Board decided that they could not continue to meet an organisation composed merely of municipal and company commercial staffs, but that the regulation of salaries to a large extent should be governed by the National Whitley Council for Local Government Services. Therefore, in order to preserve the National Joint Board to function on behalf of the technical engineers, this Association reluctantly withdrew, and conducted independent negotiations with undertakings on its standard scheme of salaries and conditions of service.

We found that so long as negotiations were being conducted with any measure of success members remained loyal, but in many undertakings, I regret to say, after the maximum benefit had been obtained, members became apathetic and dropped out. I do not think the situation has undergone any change during the past few years, and I see no possibility of such an organisation as mentioned by your correspondent securing representation upon the National Joint Board. In the past it has been claimed by the National Association of Local Government Officers that the majority of municipal commercial staffs are members of that organisation, and that they are, therefore, well catered for.

Regarding the point raised by "Protection," I agree with him that if it were possible to conduct an organisation dealing with the exploration of commercial and business methods, and other matters outside the scope of the E.D.A., a tremendous amount of good could come of it, always provided sufficient members were interested, and would not expect an Association to spend the greater portion of its time and money in negotiations for improved salaries and working conditions. A few years ago we endeavoured to extend this phase of our Association's objects, but we found that members were not sufficiently interested to carry on with it.

I think we might have had a better chance had the Central Board not superseded the main powers of the Joint Electricity Authority. When the London and Home Counties J.E.A. was first formed, it was primarily due to this organisation that two workers' representatives were appointed members, and had it been possible to pursue that policy in other parts of the country the question of organisation would have been simplified.

Perhaps, therefore, as "Commercial" says, if the Central Board were to step in and take full control of municipal supplies, lock, stock and barrel, the wedge would be driven between the present municipally owned undertakings, and other departments of local government services, and the commercial staffs would find it to their advantage to combine with the company men in one organisation.

G. R. SMITH, *Hon. General Secretary, Electricity Supply Commercial Association.*

Bexley Heath, *December 7th*, 1931.

One Big Conference

The interesting suggestion in the current issue of the ELECTRICAL REVIEW has so much in its favour that even a contractor can understand the electrical responsibilities and privileges involved. In the routine of a contractor's business, time is a factor, and however one may desire to attend conferences the inducement which you contemplate would undoubtedly be the last needed encouragement.

Co-operation in our industry would undoubtedly be made a reality by such a collective assembly should the conventions of the I.E.E., the I.M.E.A., and our own E.C.A. be the outcome of your welcome lead.

Someone has said that a committee is a device for dividing responsibilities and postponing action, so that the cheering suggestion for the three Presidents to get together will I trust have the happy result of one combined electrical conference annually.

Manchester, *December 11th*, 1931. WATCHFUL.

[Other communications have reached us expressing approval of our suggestion.—EDS. ELEC. REV.]

Conditions in British Guiana

With reference to "Query's" letter in your issue of December 11th, as to how information may be obtained regarding the cost of living in the Colonies, I would suggest the quickest way to obtain such information would be to make inquiries direct to the Colonial Office. A small questionnaire could be made out covering the principal items such as hotel and boarding house charges, cost of clothes, servants' wages, &c.; this would facilitate an early reply.

Regarding the particular position in which "Query" is interested I would like to caution him in applying for such posts. The term is for three years, at the end of which he must risk re-appointment or, to put it plainly, be "scrapped," as I have seen quite often in the East. Many engineers in the Colonies lose their jobs after a short term without any question of inefficiency on their part—sometimes political causes are to blame.

Sometimes posts are created following the installation of special new plant. After the "novelty" has worn off, the European engineer is dispensed with.

CRITIC.

Shame!

I see that "One of the Old Brigade" cries shame upon the I.E.E. because of an alleged use of non-electric tea urns.

I am afraid your correspondent is very poorly informed, or not practised in observation in these matters. The urns in question are all electrically heated (six electrically heated urns have been in use for 20 years).

London, E.C.1, *December 14th*, 1931. H. MARRYAT.

The Electric Heating of Buildings

In your report of the recent discussion on the above subject at the I.E.E. you quote Mr. Grierson, who led the discussion, as having instanced the new British Embassy at Washington as being a building where the ceiling panel system is very efficient, saving some 40 per cent. of the running costs of standard practice.

The building in question is certainly heated by the ceiling panel system, but not by the electrical method as your report appears to imply. The system used is a hot-water one with oil-fired boilers. Further, the percentage saving in running costs was computed by comparing the actual running costs of the Embassy with those of American buildings, where the temperature is usually maintained at 70 deg. F., as compared with 60 deg. F. which is usual in buildings occupied by British.

Incidentally, the saving of 40 per cent. claimed was in comparison with the admittedly more expensive system of steam heating and was very considerably less when compared with the hot-water radiator system.

December 12th, 1931. J. M.

Electric Clocks

The technical merits of the various systems of electric clocks have been discussed at some length recently. In deciding upon an electric clock installation the question of cost must also be taken into consideration, and each installation has its special features and requirements.

For example, public clocks and those in institutions, large factories, railway stations, &c., demand absolutely accurate timekeeping without risk of stoppage due to the failure of supply. The initial cost is a secondary consideration, but the cost of maintenance must be low.

On the other hand, in clocks for domestic use the cost is a primary consideration, and an occasional stoppage or a deviation of a few seconds from Greenwich time is not a serious inconvenience.

Summing up, therefore, the following appear to be the most suitable systems for the various purposes enumerated:—

Business premises, public clocks, very large private houses, &c.:—Impulse type.

Other private houses (where time-controlled a.c. is available):—Synchronous type.

Private houses (where controlled supply is not available):—Electrically wound or battery-driven types.

Ships:—Impulse system, the master clock having a balance wheel escapement instead of a pendulum.

Street lamp switches, and other applications where time must not be upset by a current failure:—Electrically wound type.

Synchronous clocks at present on the British market are of the silent variety; a striking and chiming pattern is necessary to compete with spring-driven clocks for domestic use. No doubt manufacturers will rise to the occasion.

Swindon, *December 14th*, 1931. S. F. PHILPOTT.

[We believe a chiming synchronous clock is available.—EDS. ELEC. REV.]

I cannot speak as to an installation of 50 clocks in a hospital, such as that alluded to by Mr. Ball in your current issue, but I can testify as to the more than satisfactory behaviour of an installation of that number of "Synclocks" in what I hope I may be pardoned for describing as the most up-to-date hotel in London.

These clocks, which are installed throughout the public rooms of the Dorchester Hotel, are connected to the mains of the London Power Co., no special feeders having been run, and from the day they were set to work in April last until now they have required no attention of any kind. Throughout this period they have never been more than a few seconds off true time.

Since the question has been raised by some of your correspondents, I may point out that the change from winter to summer time, or vice versa, has been carried out twice since these clocks were installed. It was found to take a remarkably short time and gave no trouble whatever.

P. S. BUSH,
Engineer to the Dorchester Hotel.

London, W., *December 14th*, 1931.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Circular-front Bulkhead Fitting

The latest addition to the range of bulkhead lighting fittings produced by HOLOPHANE, LTD., Elverton Street, Vincent Square, S.W.1, is the circular-front model shown. It is suitable for use in damp positions, as there are no holes through the casing other than the one tapped for ¾-in. conduit connection. The fitting is light and compact, and three cast-on feet provide for wall or similar fixing. Lamps of from 40 to 75 W may be used and correctly focused.

Holophane circular-front bulkhead fitting

An efficient prismatic reflector is secured in the body portion of the unit, and a circular-front lens with a specially designed internal prismatic construction is fitted to the front cover. This lens spreads a considerable proportion of the light in sideways directions, and a smaller amount is directed downwards towards the floor immediately below the unit. The lens has a perfectly smooth exterior, thus making the maintenance of the light output an easy matter. The interior and exterior finishes are white and green cellulose, respectively, and the face between the body flange and the front cover is ground flat and smooth.

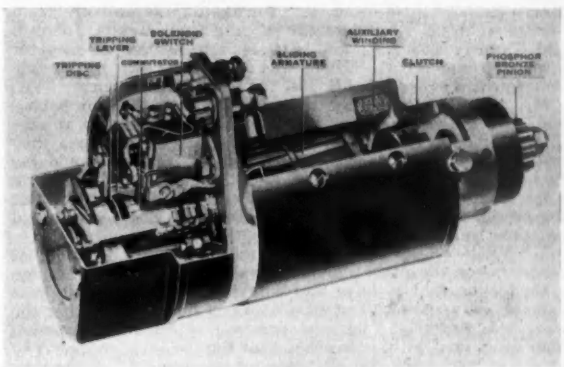
Interchangeable-stencil Signs

"Centerlite" electric signs are the latest innovation in day and night signs by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2. Their principal feature is interchangeable stencils so that they may be employed in shops and stores, theatres, cinemas, hotels, ships, &c., for various directional and indicating purposes. Incorporated in this type of sign is a special form of irregular reflecting glass mounted in a square frame. The illuminating sources are "Osram" single-ended tubular lamps, which are so placed that the light is directed down inside the glass and reflected over a wide area towards the eye of the observer. Between the irregular reflecting glass and the outer glass a special type of stencil cut with the required lettering or design is inserted. The special reflecting glass reveals the wording or design almost as effectively by day as it does under artificial lighting by night. The colour scheme of the signs can also be altered at will, the stencil surround being opaque or luminous as desired. The signs are so constructed that they can be fitted with single or multi-coloured slides, and they are supplied complete with lampholders, flexible cords and adaptors for fitting into any ordinary lampholder. They are available for single- or double-sided wording or design, and for indoor or outdoor use, the latter being fitted with a special waterproof covering. Standard finishes are bronze or black for indoor use and stove enamelled or cellulose sprayed to any required colour for outdoor use. Chain-suspension, wall, pedestal, counter and other constructions are available.

Suspension "Centerlite" sign

Commercial-vehicle Engine Starter

Entire absence of complicated safety devices, positive and silent engagement operations, and no risk of damage from engine backfire, &c., are the main advantages claimed for the "Axial" electrical starter made and introduced by C.A.V.-BOSCH, LTD., Acton, W.3, for large commercial-vehicle petrol engines. The field winding is divided into main series, auxiliary series, and shunt windings. When the starter switch is operated a small current passes through the shunt and auxiliary windings, causing the armature to commence to rotate slowly. Simultaneously the magnetic field set up pulls the armature forward, which brings the pinion gently into mesh with the engine flywheel teeth. This movement of the armature also causes the tripping disc to operate the tripping lever attached to the contacts of a solenoid switch which completes the main circuit. The full current from the battery then flows through the armature and series winding, and the motor exerts its full torque on the engine. Directly the engine gets under way, the motor current is greatly reduced, the magnetic field is decreased in power, the tension of the spring overcomes the force exerted by the magnetic field and the pinion automatically disengages. An important feature is that even by keeping the starter switch pressed, the starter will not again engage with the teeth on the flywheel rim. It will

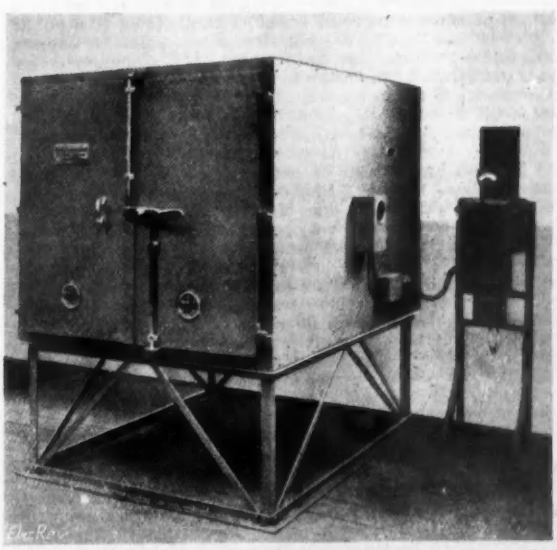


The "Axial" petrol-engine starter

continue to run free, and will come to rest immediately the switch is released. A unique overload device prevents damage resulting from engine backfire. This is a simple clutch arrangement which has about three times the lock torque of the starter, but is below the shearing force of the pinion teeth. This device is a positive safeguard against the teeth of the pinion being sheared due to excessive load. The pinion is made of a phosphor-bronze alloy which allows the wear to take place on the pinion in preference to the teeth on the flywheel rim.

Medium-size Industrial Oven

The "Evenheat" oven has been designed and manufactured by MITCHELL GRAHAM & SON, LTD., 56, Buccleuch Street, Edinburgh, to meet the demand for an equipment with high thermal and electrical efficiencies to occupy an intermediate place between the domestic oven and the comparatively large baker's oven. The following are leading features of the design: Complete protection of the special heating elements by the makers' duplex method of ventilating the oven and heating space; uniform distribution of heat throughout the whole oven, together with close regulation of temperature by means of accurate thermostatic control; efficient heat insulation between the inner and outer shells, the major portion of the heat loss being by convection through the ventilating ducts which are necessary to carry away moisture and fumes from the material undergoing treatment; entirely automatic control obtained by an adjustable thermostat incorporated with a dial reading thermometer and operating a separate contactor panel, so that after the initial setting no further attention is necessary. The oven is constructed throughout of sheet steel plate built up and rigidly braced on a substantial angle-iron framework and mounted on a strong angle-iron base, the external fittings being chromium plated. Adjustable door ventilators, shelves, removable trays, &c., can be fitted as required.



"Evenheat" oven (52.5 cu. ft. capacity)

Legal

The Appointment of a Referee

Before His Honour Judge Spencer Hogg, at the Epsom County Court, on December 9th, Mrs. Edith Cohen, Cheam, brought an action against Andrew Burton, building contractor, Cheam, and Messrs. Johnson & Tanner, Ltd., electrical engineers, Worcester, for damages for alleged breach of warranty.

According to the statement of claim the work was carried out by Messrs. Johnson & Tanner acting as the servants or agents for Mr. Burton. For damages for breach of contract Mrs. Cohen claimed from Mr. Burton or alternatively from Messrs. Johnson & Tanner, £21 9s., and from Messrs. Johnson and Tanner, £53 10s., and £14 14s. in respect of fees for inspection and report. There was a counter-claim by Messrs. Johnson & Tanner for £11 15s. for work and labour.

Mr. Wilfred Powell, for the plaintiff, said that all parties had agreed that the case should go to an electrical referee if His Honour consented, and that the only question they wanted him to decide was as to who the referee should be. Plaintiff asked that he should be a London man because it was rather in the nature of a test case. He suggested that the president of the Institution of Electrical Engineers should be asked to act.

Mr. Stanley Gibson (for Mr. Burton) objected, and said that solicitors for the other defendants also objected to a London man, feeling that to have him would put the parties to great expense. It was not a test case. It was a question whether the work was properly done, and was one which any competent man could deal with. He asked that the usual order should be made, it being left to His Honour to appoint whoever he thought proper.

Mr. David Smith (for the other defendants), said he agreed with what Mr. Gibson had said, and submitted that the case was quite an ordinary one that presented no difficulty.

His Honour said he would refer the case for inquiry and report, leaving it to the Registrar to decide upon the referee.

Overhead Lines: Compensation for Landowners

Mr. Justice Macnaghten, in the King's Bench Division on December 10th, resumed the hearing of the action brought by the West Midlands Joint Electricity Authority, against the Willey Estates Co., Broseley, Shropshire, the Rev. C. S. Jackson, Broseley, Shropshire, Mr. J. Todd, Mill Hill, Brompton, Northallerton, Yorks, and Mr. W. J. Pitt, for a declaration that the Ministry of Transport, in giving its consent under Sect. 22, Electricity Act, 1919, to the placing of an electric line across any land, was entitled to give such consent subject to conditions as to the payment of wayleave. The defence was that the plaintiffs' action was *ultra vires* (ELECTRICAL REVIEW, December 4th, p. 859).

Mr. T. Jones resumed his arguments for the defendants, and referred to the correspondence in the case which touched upon the consent already given by the Ministry in October, 1929, to the erection of overhead lines along a defined route. It was after that consent that the owners were approached under Section 22 for their consent. It was refused except on conditions to which the Joint Authority was unwilling to agree. Counsel observed that it was an interesting light on modern legislative methods that the matter should then go back to the Minister in a quasi-judicial capacity to determine a question on which he had already given his consent on an ex parte application. The application to the Minister under Section 22 was made by a letter, not communicated to the defendants, till discovery in the action, full of *ex parte* statements, which the defendants did not accept.

INQUIRY BY THE MINISTRY

After correspondence, in which the defendants were not parties, defendants received notice of the holding of a public inquiry by an official of the Ministry, who apparently, Counsel said, was not an engineer or surveyor. At the inquiry defendants put forward their claim to compensation under the Land (Assessment of Compensation) Act. There were no materials before the Inspector to enable him to form an opinion as to compensation.

In view of the consents of May, 1930, Counsel said that the Minister recited that he had considered the effect of the proposed lines on the "amenities and value" of the land. Counsel submitted that the Minister had no materials for doing so, for no evidence had been given on the point of value.

The Minister then fixed a rent of 20s. a year for towers over 13 ft. square at the base on arable land and similar sums for smaller towers. Some of the towers on the defendants' land were 24 ft. square. There was no discrimination between towers in the middle of a field and those under a hedge. There was actually a clause which reserved to the Minister power to "review" his consent after October, 1934. That might mean that he reserved power to withdraw the consent entirely or that he reserved power to vary the terms and conditions imposed.

RENT IN LIEU OF COMPENSATION

When the Minister was told that he was to have regard to the amenities and value of the land, what was meant was that the value of the land might be such that it was uneconomic to take it and pay compensation, or the amenities might be such that no compensation would be adequate. Again, the Minister had purported to give the rent in lieu of compensation. Counsel contended that compensation had to be a lump sum.

At the resumed hearing on Monday Mr. T. Jones continued his arguments for the defendants, and referred to Section 22 (2), dealing with the carrying of electric lines over railways. That sub-section made it clear that Section 22 recognised a pre-existing right to compensation, and, in the special case of a railway, security was to be given for the compensation. The payment for the compulsory erection of works was very different from a wayleave in the proper sense, which was a payment by way of acknowledgment to the landowner that works were maintained by his licence. These towers and cables were maintained under compulsory powers, and the terms and conditions to be imposed were terms and conditions limiting the public authority, not terms and conditions as to compensation.

With regard to the question as to whether the Land Clauses Act applied, Mr. Jones said that he thought that was true in this particular case, because the undertakers were subject to a nuisance clause. But if an authority were not subject to such a clause, the measure of compensation under the Lands Clauses Acts might be larger than under Section 17 of the Electric Lighting Act, 1882.

By Section 1 of the Lands Clauses (Consolidation) Act, 1845, the Act incorporated itself in any Act which authorised an undertaking and the purchase or taking of land for the purpose of the undertaking. He submitted that here there was obviously an "undertaking"; and he submitted, further, that, having regard to the size and construction of the towers, there was a physical taking of land. Whatever the result of the case he hoped that it would not be a precedent for officials of the Ministry of Transport to be interviewed by applicants for consents in the absence of the other side.

THE MINISTRY'S VIEWS

Replying for the Minister, the Attorney-General said that it was news to him that, when a Minister was concerned to know his duty in a matter of this importance, he could not come to the Court and ask what he ought to do. If the defendants were entitled to arbitration under Section 17 of the Electric Lighting Act, 1882, the arbitration would be by an arbitrator appointed by the Minister of Transport; with that they seemed to be perfectly content. But if they were to have their compensation assessed by the Minister on the report of someone they seemed to have a deep grievance.

The Lands Clauses Acts, he said, did not apply, because Section 22 had provided a special method of arriving at the compensation. That section was taken from the Telegraph Construction Act, 1916, and went farther back to the Telegraph Act, 1878, where "terms" was qualified by "pecuniary or other." In the Act of 1919 Parliament realised that nothing was gained by the words "pecuniary or other," since every term must be "pecuniary or other."

One of the factors which the Minister had to consider was what was fair to the landowner. But he had also to consider what was for the public benefit, and whether the cost of a proposed scheme was reasonable.

His Lordship reserved judgment.

Parliamentary Notes

[From Our Special Reporter]

Rural Electricity

On December 7th Sir J. Withers asked the Minister of Transport whether his attention had been drawn to the difficulty experienced by inhabitants in small villages in drawing supplies from the main electricity lines which were taken through their districts; and whether he would direct an inquiry into the matter and particularly into the question of the prices charged for laying auxiliary cables and supplying electricity in such cases.

Mr. Pybus said that the question of improving the supply of electricity to rural areas had been under consideration by the Electricity Commissioners and by the conference convened by them for investigating various aspects of rural electrification. If Sir J. Withers had any particular cases in mind, he would have them investigated if he was furnished with the necessary information.

The Severn Barrage

On December 7th Mr. L. Smith asked the Minister of Transport whether, in view of the financial position of the country and the doubts which had been expressed as to the economic advantages of the Severn Barrage scheme, he would reconsider the decision to issue a report on this matter in 1932 and arrange for the conclusion of the inquiry forthwith.

Mr. Pybus said that the present stage of this important scientific and technical investigation was on the verge of completion, and it would be wasteful not to formulate such conclusions as could be drawn from data accumulated at considerable cost. No decision regarding the publication of this report or the future of this inquiry would, however, be taken until the report had been received.

Wireless Licences

On December 10th Sir K. Wood, Postmaster-General, stated that the number of wireless receiving licences in force on October 1st was about 4,101,000, made up as follows: England, 3,682,000; Wales, 140,000; Scotland, 244,000; and Northern Ireland, 35,000.

New Books

Talking Pictures. By B. BROWN, B.Sc. Pp. xi+305; figs. 161. London: Sir Isaac Pitman & Sons, Ltd. Price 12s. 6d. net.

This work appears to result from considerable practical experience and intimate knowledge of the various talking-picture systems in operation. Further, it is well written and well illustrated, but we reached the end without being able to form an opinion for whom the book was intended. Clearly it is not written for the expert, for Mr. Brown states in his preface "This book endeavours to show exactly how the job is done without avoiding any essential point. In the main, explanations are mechanical rather than electrical, since even the electrical engineer cannot help visualising a 'current' as something which flows like water. Practical illustrations of theoretical reasons are rarely accurate, and no excuse is made for departing from mathematical truth if a grasp of the subject is thereby enhanced." This leaves one to decide whether it is for the layman or for the professional talking-picture operator that this book has been written; if the latter then a great deal of the matter contained therein is superfluous, while if the former then we are afraid that Mr. Brown has misjudged his public, for it prefers entertainment in the form given by John Scotland in his book, "The Talkies" (ELECTRICAL REVIEW, January 2nd, 1931), to being instructed about the subject in an academic style.

We suggest that when Mr. Brown gives us another book he should take courage and write up and not down to his public.

Electricity and Magnetism for Higher School Certificate and Intermediate Students. By S. G. STARLING. Pp. 345; figs. 254. London: Longmans Green & Co. Price 6s.

While there are multitudes of elementary guides to this science and a sufficiency of higher treatises on the subject, the intermediate grade is less amply catered for. Mr. Starling has in fact himself provided examples of both the lower and higher types of text book and he has now done an equally useful service for the student who may be reading for his Inter-B.Sc., or Higher Certificate.

The student at this stage is rightly assumed to know something of the calculus, and the author uses the calculus methods and notation throughout the book. A just balance is maintained between the purely mathematical and the experimental side of the work.

We are inclined to think that, at this stage, the student should be encouraged to refer to larger and more detailed treatises for further information and we should therefore have welcomed either a brief bibliography or direct footnotes referring to books for further study.

The usefulness of the book is greatly increased by a good selection of examples at the end of each chapter. It is evident, however, that the author expects the book to be used as a class-book rather than by the private student, as he gives no worked examples. Emphasis is also placed on the necessity for practical work, but no actual directions for experimental work are given.

Radio Receiving Tubes. By J. MEYER and J. F. WORSTREL. Pp. ix+323; figs. 203. Second edition. London: McGraw-Hill Publishing Co., Ltd. Price 15s. net.

This second edition became necessary, the authors say, "mainly because of the development of new types of radio receiving tubes and the improvements which have been made in types of tubes already in use."

The principles underlying the use of valves in radio receiving circuits occupy the first half of the book, and no use is made of advanced mathematics. A short chapter on transmitting valves is good so far as it goes, but the specifications for valves deal only with American makes and will therefore be of little interest to British readers. The chapter dealing with the industrial applications of valves, which includes weighing and measuring, moisture control, telephone repeaters, prospecting, lifts, packaging, time switches, and radio surgery, breaks new ground so far as ordinary textbooks on valves are concerned.

The book will interest those who are concerned with American valve practice or the industrial applications of valves, but viewed as a general textbook on valves for radio working the information given can be obtained in other less expensive publications.

The Problem of Fluctuating Loads on Boilers. By G. E. HIDER. 9 in. by 6¼ in. by ⅜ in. Pp. 115; figs. 35. London: Charles Griffin & Co., Ltd., 42, Drury Lane, W.C.2. Price 7s. 6d. net.

The author sets out to indicate the ways and means whereby the effect of a "governor" can be obtained with a battery of boilers, so that, despite fluctuations of load, the boiler plant may always be operated at or about the condition of maximum economy. By the term fluctuation of load, however, he implies mainly that due to conditions such as those prevailing in steel-rolling mills or in colliery winding plant where a direct drive is obtained through reciprocating steam engines.

He rightly stresses from the outset that the question of "water content" is of fundamental importance and, since even with the large "tank" boilers of the Lancashire or marine type there is not sufficient water capacity to meet any wide fluctuations in the load, he is led to a study of the various systems of thermal storage, the best known of which come under the heading of steam accumulators. These are generally installed in conjunction with tank-type boilers, but on the Continent, where the subject of fluctuating loads has received greater attention than it has in this country, so much progress has been made that already installations are in use in which the high efficiency water-tube boiler is used in conjunction with steam accumulators, with very satisfactory results.

This opens up the possibility of using some system of storage in the electrical power station, particularly where the total output is small and the fluctuation of load is considerable. The book is thoroughly practical in its outlook and the author is able to point out the advantage of the systems he advocates in £. s. d.

Wireless. By L. B. TURNER. Pp. xvii+528; figs. 342. London: Cambridge University Press, Ltd. Price 25s.

This book is a development of the author's "Outline of Wireless," which has lost some of its potency with the rapid progress in the art during the past ten years. It represents a very readable and comprehensive survey of the present state of knowledge of radio communication. It does not specialise in any one branch, but gives a lucid explanation of the fundamental principles, backed by mathematical argument and illustrated with many diagrams, numerical examples relating to actual installations, and descriptions of current practice.

The arrangement of the matter is rather novel. All the photographic illustrations are grouped together in the middle and there are certain marked sections which, whilst of interest to more advanced readers, may be omitted if desired without interrupting the general thread.

Although it is regretted that valves for mains operation and multi-grid valves, such as the pentode, do not receive more attention, the work, as a whole, presents a good general survey of modern radio knowledge in a most readable form.

Elektrowärme Jahrbuch, 1931 (Electric Heating Year Book). Edited by PROF. DR. ING. E. L. G. DETTMAR. Pp. 327. Charlottenburg: Schubert & Co. Price 10 Rm.

This work, which is issued under the patronage of the German Association of Electrical Engineers (V.D.E.) and the Association of German Electric Power Stations, covers generally the progress of electric heating and its importance to the electrical engineering industry. Such matters as the design and standardisation of electric heating appliances are dealt with, as well as the economics of electric heating, cooking and non-ferrous metal melting. The applications of electric heating in agriculture are touched upon and there follows a series of articles on the present position of electric heating in Norway, Austria, Sweden, Switzerland, and the United States, together with particulars of the official regulations and standards in operation in Germany.

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Shorter Notices

"Electrical Equipment." By Harold W. Brown. Pp. xvii+586; figs. 328. London: McGraw-Hill Publishing Co., Ltd. 30s. net.—This is a second edition of a work published in 1917. It has been rewritten and strengthened by the adoption of a more practical point of view. Thus the scope now includes industrial applications, such as electric heating and welding. There are elaborate talks of costs, which, being expressed in dollars, and applicable to American conditions, should be used with caution.

"Alternating-current Circuits." By J. M. Bryant and J. A. Correll. Pp. xv+483; figs. 355. London: McGraw-Hill Publishing Co., Ltd.—The first edition of this book was published in 1925, and the present one differs from it chiefly in the addition of a new chapter on unbalanced loads and voltages in polyphase circuits, which is highly mathematical. The set of problems which have been introduced at the end of each chapter should make the work more useful for students preparing for examinations

"Problems in Electrical Engineering Direct Currents." By Waldo V. Lyon. Second edition. Pp. xii+154; figs. 68. Price 10s. 6d. "Problems in Electrical Engineering Alternating Currents." By Waldo V. Lyon. Second edition. Pp. xii+233; figs. 40. Price 13s. 6d. "Alternating-current Circuits." By J. Myron Bryant and James A. Correll. Second edition. Pp. xv+492; figs. 355. Price 27s. "Principles of Electrical Engineering." By Grover C. Blalock. Pp. xvi+498; figs. 339. Price 24s. "Electrical Equipment." By H. W. Brown. Second edition. Pp. xvii+586; figs. 331. Price 30s. London: McGraw-Hill Publishing Co., Ltd.

"The Australian Tariff Debacle." By S. F. Ferguson, with a foreword by the Joint Committee for Tariff Revision, and an introduction by Sir Hal Colebatch. Pp. 32. Obtainable from the Australian Association of British Manufacturers, Australia House, W.C.2.

"A Dictionary of Electrical Terms." By S. R. Roget. Second edition, revised and enlarged. Pp. vii+396. London: Sir Isaac Pitman & Sons, Ltd. Price 7s. 6d.

"Housing—A Citizen's Guide to the Problem." Compiled by Kathleen M. England, with a foreword by John Galsworthy. Pp. 116; illustrated. London: Chatto and Windus. Price 2s. 6d.—Among the articles which this interesting little book comprises is one by Miss Caroline Haslett on "Electricity in the Working-class Home."

Contractors' Supplies in New Zealand

A CONFIDENTIAL report has been prepared for the Department of Overseas Trade by the Trade Commissioner at Wellington on the market for electrical contractors' supplies in New Zealand. This states that elaborate wiring regulations exist which give clear indications of the systems of wiring and class of material used, but they are undergoing revision, and it is expected that the revised regulations will be issued early in 1932.

Steel conduit encased wiring systems are almost invariably used, but only screw steel conduits are allowed in New Zealand. At least 95 per cent. of the conduit is of United Kingdom origin. The c.t.s. system is allowed. Certain conduit accessories are manufactured in the Dominion, but those imported are mainly British. American conduit flush switch boxes are in general use.

The statistics of imports of conduits are by no means clear, some difficulty having been experienced by the Customs Department in compiling figures for this category. The separate listing of electrical conduits is therefore to be discontinued, and they will in future be included under the headings of pipes and tubes, of which the import figures show at least 80 per cent. to be of British origin. The Customs tariff on electrical conduit is as follows:—British preferential rate, free and 3 per cent. primage; general rate, 24½ per cent. *ad valorem*; Australian rate, free and 3 per cent. primage.

Distribution boards are not imported but are made up in New Zealand, with the exception of a small number of the ironclad type, which, together with ironclad switches and fuse boxes, come mainly from Great Britain. The bulk of the fuses imported come from the United Kingdom, but there is a small amount of Continental fuse wire imported. Switches are mostly of United Kingdom origin, but some come from the United States. The tumbler type is used practically universally.

Lampholders, Plugs and Lighting Fittings.

As regards lampholders, the bayonet type is used almost exclusively, and the great bulk of those imported are of United Kingdom make. Ceiling roses have in the past been imported from both the United Kingdom and the Continent, but the British Standard has now been adopted and the New Zealand Government will insist upon it. This should enable United Kingdom firms to dominate the market. The flat pin plug is in general use and most are of the three-pin type, although the two-pin pattern is also used. Most imported plugs are of United Kingdom origin but there is a considerable importation from the United States, while German synthetic resin plugs and sockets are also on the market.

Lighting shades and fittings are imported from a number of countries including the United Kingdom, the United States, Canada and Europe. Glass, opal and fancy shades are obtainable at a low price from the Continent, and a fair proportion of industrial and fancy fittings come from Canada and the United States. The Customs duties on shades are as follows:—British preferential, 24½ per cent. *ad valorem*; general, 55 per cent.

House service meters are principally of the single-phase type and usually of United Kingdom and Canadian origin, but specialised and intricate types used in central stations and sub-stations are mostly of foreign manufacture—American and Swiss. Customs duties payable on household meters are at the following rates:—British preferential, free and 3 per cent. primage; general, 24½ per cent.

The value of imports during 1928, 1929 and 1930 were £50,350, £77,326 and £71,279 respectively, of which the United Kingdom's share was £38,427, £47,361 and £39,645.

Intensive Development.

Electricity supply is already developed to such an extent in New Zealand that no great increase in the demand for electrical contractors' supplies can occur. Reconditioning of old wiring and the erection of new houses, of which there is little at the present time, supply practically the only opportunities for the articles under discussion. The United Kingdom has done better in securing a reasonable share of the import trade in these goods than in many other cases.

In the official statistics, switchboards, fuseboards, distribution boards or boxes for electric circuits, switches, wall plugs and shoes or sockets therefor, fuses, wire or cable connectors and similar articles and terminals are included under item 552 B with a multitude of other goods such as sparking plugs, arc lamps, carbons, &c. The values of the imports of these goods for 1928, 1929 and 1930 were £286,114, £208,175 and £308,175 respectively, of which the totals of British origin (United Kingdom, Canada and Australia) were £214,946, £143,792 and £208,402. The tariff on these goods is as follows: British preferential, free and 3 per cent. primage; general, 30⅝ per cent. *ad valorem*; Australian, free and 3 per cent. primage.

A further nondescript statistical category is item 553 including goods liable under item 338 (10), "electrical machinery and goods not elsewhere specified," of the customs tariff to duties of 24½ per cent. British preferential, 55½ per cent. general, and 24½ per cent. Australian rates.

Electrical contractors' supplies are imported by wholesale houses and by contractors indenting direct. There are 3,600 registered electricians in the Dominion including approximately 400-500 wiring contractors. There are a number of wholesale houses, probably about 45, who also sell retail.

Trade Opportunities in Egypt

A CONFIRMATION of the conclusions reached by the recent United Kingdom Trade Mission to Egypt (ELECTRICAL REVIEW, May 22nd. p. 874) is contained in a Department of Overseas Trade report on economic conditions in Egypt by Mr. R. M. A. E. Turner, O.B.E., British Commercial Secretary at Cairo.

The high prices of British goods are once more put forward as the principle handicap to British trade with the country, and the report states that a very shrewd and conservative observer, with many years' experience of the market, declares his conviction that the decrease in the United Kingdom's share of the trade of this country is ascribable, as to 60 per cent., simply and solely to the price factor. Other people credit the whole of the decrease to high prices.

In considering the highly competitive nature of the Egyptian market it must be borne in mind that, despite its population of approximately 14,500,000 and the very great progress made of recent years in various directions, there are probably only some 2,000,000 people in the country who are potential customers for the majority of western manufactured products.

British Goods Appreciated.

The reputation of British goods for high quality is still generally accepted as almost axiomatic, but, like many axioms, is not necessarily accepted by the individual in his private life unless it is brought forcibly home to him. Much has been said of the value of visits to their foreign markets by British manufacturers, but it is well that the advertisement value of such visits should not be overlooked. In cases which are known where British directors or managers have visited Egypt and made the personal acquaintance of their customers, a tangible benefit has nearly always resulted.

In dealing with an illiterate buying public it is desirable that articles should be so clearly marked that it will be easy for a would-be "repeat" customer to indicate the exact article he wants.

Care must be exercised in the appointment of agents; although British firms are on the whole well served by their representatives, there are still too frequently signs of carelessness in this respect.

In spite of abnormally low quotations by Continental firms British manufacturers have been able to hold their own in the electrical machinery market. Imports from the United Kingdom during 1930 show a healthy increase as compared with the previous year, due largely to important orders placed by the Egyptian Government. Of electrical machinery to the value of £E687,167 imported during 1930, Great Britain obtained orders amounting to £E197,853, her most serious competitors being Germany with £E131,482, and France with £E86,519.

With regard to the general market for electrical appliances, fittings, wiring, &c., British firms have made little, if any, progress owing principally to the extraordinarily low prices quoted by Continental competitors and, to a certain extent, to the heavy stocks carried by the latter. Both as regards electro-medical apparatus and ordinary electrical appliances, only a very few representatives of British firms carry any form of stocks and still fewer possess adequate service organisations.

Opportunities for Radio Manufacturers.

Despite the peculiar position of the radio market due to the lack of authorised broadcasting facilities, considerable progress has been made by American and Continental manufacturers during the last two years. While sales of British radio receivers have been creditably developed through the efforts of a few enterprising representatives, there is still much room for improvement.

Imports of radio apparatus during 1930 amounted to £E52,043, as compared with £E29,094 in 1929; Great Britain's share fell from £E10,823 to £E5,680. Germany was responsible for £E6,457, as against £E4,766; Holland, £E6,889 (£E4,579); and the United States, £E6,919 (£E3,831).

The success of foreign competitors has been partly due to their more elastic credit terms and partly to greater facilities accorded to their agents.

In conclusion, the report states that the immediate outlook for trade with Egypt is far from hopeful, and, unless there is an improvement in the world's cotton market, imports must, it would seem, still further decline and price become even more the deciding factor than it is to-day.

Italian Electrical Trade

A return recently to hand shows that the imports of electrical machinery, apparatus, and supplies into Italy during the eight months ended with August last attained a value of £1,782,625, as compared with £2,586,165 in the corresponding eight months of 1930. The exports of similar material from Italy during the same period also declined, from £622,215 to £613,295.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

A Large E.D.A. Poster

In its December programme the British Electrical Development Association announced that it would shortly issue a 16-sheet poster (80in. by 120in.) dealing with electric cooking. We have now received a copy of this poster (E.D.A.972), which is in four colours, and shows a lady apparently attending to saucepans on an electric cooker, with the appropriate slogan, "Electric cooking makes the best of things." While the fact that one only has a back view of the lady may prove intriguing, we should like to see her facing us, and showing to what use she is putting the cooker.

Recent Contract

The Ford Motor Company has placed an order with the British Thomson-Houston Co., Ltd., for three Diesel-electric locomotives required for shunting service at the new Dagenham Works. As main contractors the B.T.-H. Company is manufacturing the generators, complete electrical equipment, and mechanical parts of locomotives, while Messrs. W. H. Allen, Sons & Co., Ltd., are supplying three medium-speed six-cylinder Diesel engines of 150 b.h.p. to run at 550 r.p.m. Each Diesel engine will be equipped with centrifugal water pumps working on a radiator. Ample lubricating oil cooling will be provided by a system self-contained in the engine, and the cooling arrangements will not depend on a separate cooler. This obviates the necessity of running the lubricating oil connections between the engine and the radiator.

Works Extension

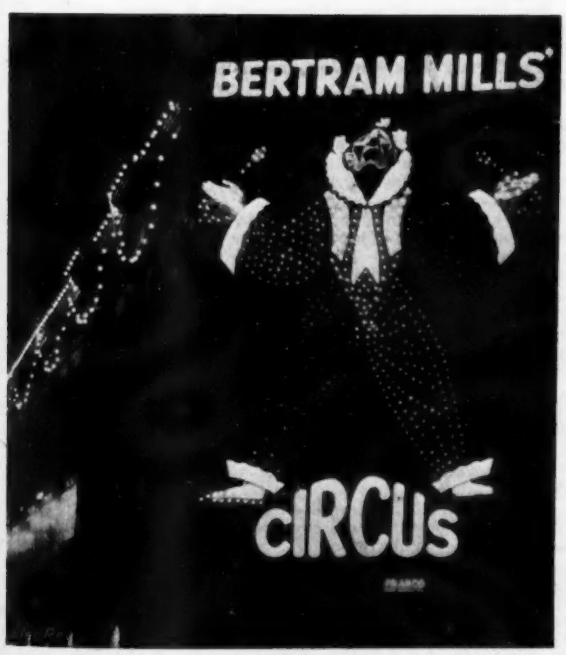
Messrs. Herbert Terry & Sons, Ltd., have added a new wing to their main factory at Redditch to enable them to cope with the increased demand for their springs, flexible shafting, presswork and other products. They also have in hand an addition to the general office block, and further building operations are in prospect.

Industrial Development at Birmingham

A new departure in English civic publicity is made by the publication of a descriptive brochure in connection with the Birmingham Corporation's industrial development programme. Graphs and diagrams indicate the city's attributes as an industrial centre, its railway and transport facilities, and the wide variety of trades catered for. Particulars are also given of the excellent services provided by the Corporation electricity undertaking, which, with over 111,000 consumers, now has apparatus representing 400,000 kW connected to its system.

An Amusing Illuminated Sign

A coloured sign depicting a clown juggling has been erected by the Franco-British Electrical Co., Ltd., at Olympia, in



An illuminated clown at Olympia

connection with Bertram Mills' Circus. For the figure itself, which is 18 ft. wide by 27 ft. high, over a thousand 15-W "Osram" lamps are used, while in the wording there are 175 40-W "daylight" lamps.

New G.E.C. Branch

The new Blackburn branch of the GENERAL ELECTRIC CO., LTD., was formally inaugurated by the Mayor on December 11th. The new premises are in Darwen Street, in the centre of the town, and in close proximity to the Corporation electrical showroom. They are spacious, and on the upper and lower floors there is a complete display of lighting fittings and domestic appliances.

At the inaugural luncheon, the Mayor said that they, in Lancashire, were eager to encourage new industries, and he

Opening of new G.E.C. Blackburn branch
Mr. J. H. Farthing, the Mayor, and Mr. H. W. Roberts

considered that the new branch of the company would provide a stimulus. Mr. J. H. Farthing, the company's general manager for the Manchester area, said they did not intend to compete with local electrical contractors, as their policy would be solely wholesale. They hoped to work in close co-operation with contractors by demonstrating the merits of electrical appliances. Mr. H. W. Roberts has been appointed manager of the new branch, which is the twenty-fifth that the company has opened.

New S.W. & S. Showrooms

The Shropshire, Worcestershire and Staffordshire Electric Power Co.'s new showrooms and offices, which occupy the major portion of the new Corporation Building, at Hereford, were recently opened in the presence of a large and representative company by Mr. L. Howles, the chief of staff at Halesowen, Birmingham, the company's headquarters. Two large showrooms are at present occupied by exhibitions of "Magicoal" electric fires and "Revo" electric cookers. There are also displays of vacuum cleaners and other electrical appliances. The cookery demonstration room seats about fifty, and is equipped with a cooker, refrigerator, hot water, and other requisites. Cookery demonstrations will be held here at frequent intervals. Above the showrooms are three offices, housing Mr. G. H. Watson and his staff. The old City Guildhall has been divided into five offices, in which will be housed the Accounts and Stores Department for the whole of the Western division. The building is equipped with electric tubular heaters, thermostatically controlled.

The Birmingham Electric Club

The annual report of the Birmingham Electric Club for the past year indicates a satisfactory financial position, the receipts amounting to £145. After meeting all expenses there was a balance of £40. The report states that the year under review again showed a certain measure of success, and there was a net increase in membership of thirty, making a total of 307, and there was an increase in the average attendance. Reference is made to the various social functions held during the year, and a list of lectures delivered during the session is given.

A New Company's Objects

Messrs. W. Monks & Co., Ltd., 2, Mayes Street, Shudehill, Manchester, say that the note on their registration in the "New Companies" section of our December 4th issue did not make their objects clear. Their main business is that of electrical and wireless factors.

The Timber Market

Our Timber Trade Correspondent reports that business in European woods is not bright owing to the continued depression in the building trade, but stocks in the country are smaller than a year ago. For hardwoods the market also is upward, especially for American woods, forward business for which has been greatly restricted on account of the high value of the dollar. Mahogany logs are selling better, and at firmer prices, and it is likely that the demand for this wood will show an increase whilst American shipments of other woods rule short. The high rates of exchange in New York also

must have a staying effect here in American shipments of plywood panelling for wireless and other cabinets. Stocks both of hardwoods and plywood for the cabinet trade are less than this time last year.

Social Events

The West Hartlepool Electricity Department recently held its fourth annual staff dinner at the Raglan Hotel, when Councillor W. A. Smith, vice-chairman of the Electricity Committee, presided over a large number of members of the staff and friends. The company included Mr. S. Tillotson, borough electrical engineer, and Mr. B. Smith, Macintosh Cable Co. The musical programme was provided by Councillor Knowlson, Messrs. C. W. Thompson, J. Hunter, J. Blanthorn, A. Campbell, and A. Bowes.

On December 7th at Crane Hall, Liverpool, members of the A.T.M. Dramatic Society under the direction of Mr. T. Fisher, the producer, gave a performance of "Lucky Dip," a comedy by Frank Vosper. Among a well-chosen and efficient cast, Miss Lily Searle, Miss Eva Campbell, Miss Gretta Downie, and Mr. Chas. Plank gave outstanding performances. During the intervals musical selections were rendered by the A.T.M. Orchestra under the direction of Mr. Heath, deputising for Capt. A. V. Barwood.

Textile-mill Conversions

With reference to our description of the electrical installation at the Whitley Mill of Messrs. Daniel Illingworth and Sons, Ltd., at Bradford, we have been informed that the whole of the wires for the wiring work, carried out by Mr. W. D. Wilson, were manufactured by W. T. Henley's Telegraph Works Co., Ltd.

A Church Floodlighting Scheme

The centenary of St. Michael's Church, Highgate Village, was celebrated recently, and the celebrations included the floodlighting of the west end and the spire. This was accomplished by a number of G.E.C. reflectors equipped with "Osram" gasfilled lamps. The cross over the doorway, which is 4ft. 6in. in height, was illuminated by a number of red olive-shaped "Osram" decoration lamps.

Change of Name

Contact, the official journal of the Association of Supervising Electrical Engineers, will change its name as from the January issue to "*The Electrical Supervisor*, formerly *Contact*." The old title did not convey to the outside world the membership that it served.

Catalogues Required

Manufacturers of electrical accessories, domestic appliances, cables, &c., are requested to forward catalogues to the Electrical Manufacturing and Supplies, 38, Little Newport Street, W.C.2.

Mr. H. W. Rawley ("The Brighton Tyre Supply"), 17a, Broad Street, Brighton, has opened an electrical section of his business, and asks for price lists of lighting and heating apparatus and sundries.

D.O.T. Trade Memoranda

A confidential memorandum on trade with New Zealand prepared by the Trade Commissioner at Wellington has been received and issued by the Department of Overseas Trade to firms whose names are entered on its Special Register. United Kingdom firms desirous of obtaining a copy should apply to the Department, 35, Old Queen Street, S.W.1, quoting reference No. C.X.3714.

A similar memorandum (C.X. 3734) dealing with Argentina is also available.

Radio Valve Manufacture in Australia

The manufacture of radio valves in Sydney is planned by two Australian companies. A new factory to be established by Philips Lamps (Australasia), Ltd., will provide employment for at least a hundred men at first. Negotiations have also been concluded whereby the Amalgamated Wireless (Australasia), Ltd., will shortly commence the manufacture of radio valves in Australia under world patent rights.

Indian Electrical Imports

The imports of electrical machinery, apparatus, and fittings into India during September last attained a value of 27,00,000 rupees (approximately £202,500) as compared with 32,00,000 rupees (£240,000) in the corresponding month of last year.

The Future of R.K.O.

A Reuter message from Baltimore states that despite internal dissensions and allegations by certain shareholders that there has been reckless expenditure by the directors of the company, the stockholders of the Radio Keith Orpheum Corporation have approved a plan for the re-financing of the company.

Spanish Telephone Contract

It is announced that a Government Bill is to be introduced declaring the contract with the Telephone Company, in which important American interests are involved, illegal and void. By a Royal Decree of 1924 the Spanish Government empowered a syndicate controlled by the International Telephone and Telegraph Co. of America to take over and reorganise the whole of the Spanish telephone services. This action has given rise to considerable criticisms and allegations involving the ex-King. As the telephone services are considered of national utility, they can come under the clause in the new Constitution providing for expropriation. The Bill, however, allows a period of six months for measures to be taken, during which time the question of an indemnity would be considered. Meanwhile, a committee would be formed composed of three representatives of the State and two of the company, whose duty it would be to supervise the administration.—*Reuter* (Madrid).

United States-Italian Electrical Agreement

The Westinghouse Electric and Manufacturing Co. has announced that an agreement has been reached with Ercole Marelli and Co., of Italy, for an exchange of all patents and experience.—*Reuter* (Pittsburg).

Czecho-Slovakian Lamp Trade

During the first nine months of the current year the value of exports of electric lamps from Czecho-Slovakia amounted to 16,500,000 crowns, as compared with 11,500,000 cr. in the corresponding period of the preceding year. The imports during these periods were 15,300,000 cr. and 22,000,000 cr. respectively.

Calendars and Diaries

A useful wall calendar has been received from British Insulated Cables, Ltd. This has three sets of monthly slips so that any date for the preceding month, current month, and forthcoming month can be ascertained at a glance. A similar arrangement covering the years 1931, 1932, and 1933 is also provided.

The 1932 diary of the National Union of Commercial Travellers is nicely bound in blue leather. It contains a good deal of information of special interest to commercial travellers, including some pages on the law affecting travellers and agents and employment hints.

A copy of Letts' "Quikref" electrical diary has been sent to us. A double page is provided for a week and, in addition to the usual information regarding postage, &c., there are 140 pages devoted to electrical formulæ, tables, definitions and other matters which constantly need to be referred to by the electrical man. It has a stout cover and contains a clear index.

The 1932 calendar of the Chloride Electrical Storage Co., Ltd., contains some clever and amusing coloured cartoons on monthly sheets.

Forty-two pages of useful electrical data and a map of the world are included in the diary of the Westinghouse Electric International Co.

A hydro turbo-generator and a power station are the subject of the calendar of the A.S.E.A. Electric, Ltd.

We have received from Messrs. W. H. Squire a striking calendar illustrating the passing of the night air mail.

The John Electrical Co.'s wall calendar has monthly sheets with the dates in bold, easily read type.

A nicely bound diary, containing a quantity of information relating to electrical matters, has come to hand from the Ateliers de Construction Electriques de Charleroi.

The Mullard Wireless Service Co., Ltd., has sent a wall calendar in the shape of a valve adorned by a pretty young lady. Daily slips are provided.

Trade Announcements

Straight-Lite Reflectors, Ltd., have moved their head office to 73, Canonbury Road, N.1. The telephone number remains unaltered but the telegraphic address is now "Lytreflect, Nordo, London."

Mr. Bernard L. Myer, till recently a representative of Messrs. Chesterton, Jones & Co., Ltd., has opened a wholesale electrical stores at 36, Oxford Street, Liverpool. He asks for catalogues, lists, and quotations from manufacturers of electrical accessories, etc.

Messrs. Mackness & Shipley are removing on January 1st next to Parliament Mansions, Orchard Street, S.W. The telephone number will remain unchanged ("Victoria 9355").

Messrs. R. H. & S. Pearson (Eastbourne), Ltd., inform us that their new showrooms (mentioned in our last issue) are for wholesale business only.

Messrs. J. H. Tucker & Co., Ltd., have appointed Mr. R. Williams as district representative for Liverpool, North Wales and the Isle of Man. Mr. Williams was for many years in charge of the company's estimating department; his home address is "Briar House," 60, Gladstone Road, Chester.

As from December 24th the London address of the British Isothermos Co., Ltd., will be Thames House, Westminster, S.W.1. The telephone number and telegraphic address are unaltered.

Prices of Materials

Messrs. F. Smith & Co. report, December 16th: Electrolytic copper h.c. wire, 7 1/16d., ¼d. dec.; silicium bronze wire, 8¾d., 1/16d. dec.

Messrs. Edward Till & Co. report, December 16th: India-rubber, Para fine, 4½d., ¾d. increase.

Messrs. James & Shakespeare report, December 16th: Copper bars (best selected), sheet and rod, no change. English pig lead, £16 5s., 15s. decrease.

Messrs. James Forster & Co. report that very little business has been moving with home consumers of lead, while Continental demand last week remained as poor as ever. From the following monthly figures it would appear as if stocks in this country must have been added to last month, as it is doubtful whether consumption has exceeded 18,000 tons. Board of Trade returns for November:—Imports, 30,487 tons; exports, 2,955 tons; leaving for home consumption 27,532 tons.

For Sale

Offers are invited by the London County Council for the purchase and removal of four electrically heated hot cupboards, &c., at St. John's Hospital.

(See our advertisement pages to-day.)

Swimming Bath Lighting

Zeiss Ikon, Ltd., informs us that the lighting fittings employed in the illumination of the swimming bath at Bourne and Hollingsworth's hostel (illustrated in our last issue) were of the Zeiss reflector type.

Latvian Electrical Imports

According to the *Board of Trade Journal*, a decline was recorded in the imports of all commodities into Latvia during September last, as compared with September, 1930. The value of imports of electrical machinery and electro-technical apparatus and parts decreased from 770,000 lats to 410,000 lats.

Brazilian Railway Electrification

The Brazilian Government is asking for proposals for the electrification of the suburban lines of the Estrada de Ferro Central do Brasil, and also of the main interior line situated between the stations of Pedro II and Barra do Pirahy. The Brazilian Embassy in London, which holds the official text containing the necessary information, will place it at the disposal of any interested parties.

Brighton Christmas Illuminations

To assist Christmas trade the Brighton Corporation has run double rows of coloured electric lamps along and across the principal shopping thoroughfares of Brighton. Many shopkeepers have entered into the spirit of the scheme and illuminated their own shop fronts.

New Australian Companies

Among the new companies registered recently in Australia are: Airzone (1931), Ltd. (Sydney), with a capital of £10,000, radio manufacturers; the Jay Manufacturing Co., Ltd. (8, Eveleigh Street, Redfern, Sydney), with a nominal capital of £5,000, cabinet makers, phonograph, radio and refrigerator manufacturers, &c.; Western Province Radio Pty., Ltd. (Hamilton), with a capital of £10,000; the Catholic Broadcasting Co., Ltd. (11c, Castlereagh Street, Sydney), with a nominal capital of £15,000; and the Clarion Radio Corporation, Ltd. (17, Bond Street, Sydney), with a nominal capital of £2,000, manufacturers and dealers of radio equipment, &c.

Claridge's Hotel

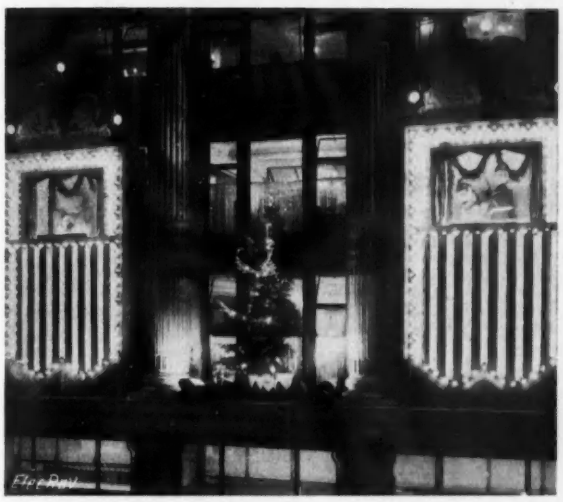
Messrs. T. Clarke & Co., Ltd., the contractors for the electrical work at Claridge's, dealt with in our last issue, inform us that Mr. Pay, the chief engineer of Savoy Hotels, Ltd., was responsible for the lay-out of the installation which was carried out with Johnson and Phillips cables in screwed steel conduit.

The Rural Consumer

Consumers' engineers who are likely to be engaged in negotiations with prospective users of electricity in rural areas would do well to secure a copy of the booklet issued by the G.E.C., Ltd., on "Electrical Equipment for the Farm and Market Garden." The text includes a number of sound "talking points" as well as the pros and cons of various methods of applying motors and other electrical apparatus for all known purposes. There is also a brief wiring specification. The electrical data given at the end will be found particularly useful in forming or giving estimates of the cost of energy for various jobs of work.

Christmas Decorations at Selfridge's

A novel and attractive form of Christmas decoration has been adopted by Messrs. Selfridge & Co., Ltd., at their Oxford Street stores. At intervals above the shop windows there have been erected ten illuminated Punch and Judy shows. They are operated by "Sentry" motors, and for the lighting approximately 300 30-W lamps are used in each box. Illuminated Christmas trees add to the seasonable effect. The electrical installation was carried out by the Imperial Lighting Co.



Two of the illuminated Punch and Judy Shows

A "Marconiphone" Hire-purchase Company

In conjunction with its associated companies the Marconiphone Co. is forming a new organisation which will deal with all hire-purchase transactions from January 1st, 1932. The new company will be known as Retailers Trust, Ltd., and will operate from 92, Clerkenwell Road, E.C.1. It will handle all the products listed in the hire-purchase schedules of the Marconiphone Co., Ltd., the Gramophone Co., Ltd., and the Columbia Graphophone Co., Ltd. Supplies of the new agreement forms with full instructions as to procedure will shortly be circulated to dealers.

British Overseas Electrical Trade in November

WE publish below our usual monthly table of electrical exports and imports. In comparing the figures for October and November it must be remembered that the latter contained two fewer working days.

An analysis of the electrical machinery exports during November discloses a decrease of £174,332, as compared with the corresponding month last year, goods exported to European countries (with a value of £142,881 as against £97,054) being the only item showing any advance. There was a large fall in the shipments to South America, the value of exports amounting to only £18,552 as compared with £128,699. Goods purchased by Australia at £9,471 were £20,909 lower, while there were decreases of £21,901 and £36,554 respectively in the exports to British India and "other countries."

Compared with October electrical machinery exports under the heading "other countries" show a decline of £90,658, goods purchased by Canada and British India also decreasing by £29,675 and £24,325 respectively. Japan bought goods to the value of £7,980, as against only £919 in the preceding month, and increases from £27,437 to £45,143 and from £2,945 to £9,471 are recorded in exports to the Union of South Africa and Australia respectively.

	EXPORTS.			IMPORTS.			RE-EXPORTS.		
	Electrical exports for Nov., 1931.	Inc. or dec. as compared with Oct., 1931.	Inc. or dec. as compared with Nov., 1930.	Electrical imports for Nov., 1931.	Inc. or dec. as compared with Oct., 1931.	Inc. or dec. as compared with Nov., 1930.	Electrical re-exports for Nov., 1931.	Inc. or dec. as compared with Oct., 1931.	Inc. or dec. as compared with Nov., 1930.
Electrical goods and apparatus (unenumerated)	£163,060	– £2,803	– £34,806	£254,320	+ £44,434	+ £93,433	£6,140	– £2,323	– £3,420
Insulated cables and wires	103,432	– 26,789	– 74,038	85,875	+ 2,273	+ 24,951	444	– 795	– 573
Glow lamps	21,360	– 5,725	– 15,163	107,454	+ 47,452	+ 58,086	880	+ 94	+ 445
Arc lamps and parts	234	– 130	– 610	4,092	– 1,408	– 476	17	+ 4	+ 3
Batteries and accumulators	65,189	– 15,971	+ 4,516	81,278	+ 2,633	+ 3,897	383	– 311	– 2,205
Meters and instruments	26,381	– 2,377	– 4,703	48,300	+ 8,285	—	397	– 102	– 8,529
Carbons	2,256	+ 321	+ 1,552	42,399	+ 17,914	+ 25,468	271	+ 184	+ 197
Switchboards (not telegraph or telephone)	2,048	– 507	– 4,960	229	+ 214	+ 2	25	– 76	+ 21
Electrical Machinery—									
Electrical machinery (unenumerated)	196,563	– 64,507	– 101,017	193,752	– 33,836	+ 87,594	10,681	+ 1,523	– 3,915
Railway and tramway motors	2,382	+ 885	– 40,928	—	—	—	—	—	—
Other motors and generators	151,700	– 45,952	– 32,387	—	—	—	—	—	—
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cables (not submarine)	19,400	+ 1,523	– 31,337	4,345	+ 319	+ 1,792	1,232	+ 1,230	+ 1,179
Submarine telegraph and telephone cable	6,935	+ 2,824	– 6,017	24,100	+ 24,100	+ 24,100	—	—	—
Telegraph and telephone apparatus	123,816	– 33,412	– 142,745	489,359	+ 186,302	+ 335,763	5,237	– 742	– 2,594
Total	£884,756	– £192,620	– £482,643	£1,335,503	+ £298,642	+ £636,305	£25,707	– £1,314	– £19,391
Decreases for the first eleven months of the year		Exports. £5,920,583			Imports. £661,641			Re-exports. £270,036	

New Catalogues and Lists

Igranic Elec. Co., Ltd., 149, Queen Victoria Street, E.C.4.—Publications Nos. 6,554 and 6,596, describing, respectively, the "Parvo" choke and a permanent-magnet moving-coil loud-speaker.

David Brown & Sons (Huddersfield), Ltd., Park Works, Lockwood, Huddersfield.—A second edition of the "David Brown Hob Book" (price 1s.), and an illustrated leaflet on "D.B.S." gear generating cutters.

Siemens & General Electric Railway Signal Co., Ltd., Central House, Kingsway, W.C.2.—A 60-page illustrated catalogue of street traffic signals.

Ateliers de Constructions Electriques de Charleroi, 56, Victoria Street, S.W.1.—The December stock list of electric motors, generators, transformers, &c.

E. K. Cole, Ltd., Southend-on-Sea.—The December issue of the "Ekco" service bulletin.

Electro Dynamic Construction Co., Ltd., Devonshire Grove, S.E.15.—List No. 102, giving details of phase advancers for power factor correction.

National Gas Engine Co., Ltd., Ashton-under-Lyne.—Publication No. 901a, covering the company's latest range of vertical oil engines of from 16½ to 165 h.p.

S. Bill & Co., Ltd., Queen's Road, Aston, Birmingham.—An illustrated descriptive leaflet dealing with the "Botrade Insulok" all-insulated switch-fuse and switch splitter. Priced.

Elliott Brothers (London), Ltd., Century Works, Lewisham, S.E.13.—Catalogue sheet G.53/54, illustrating and describing link and fuse pattern current transformers and direction-finding apparatus.

Wm. Sanders & Co., Falcon Electrical Works, Wednesbury.—A 40-page illustrated general catalogue of switchgear.

Benjamin Electric, Ltd., Tariff Road, Tottenham, N.17.—The December issue of the "Reflector," containing some good pictures of industrial and cinema lighting.

Bankruptcy Proceedings

A. W. Kingston, wireless manufacturer and engineer, Graham House, 9, Newman Street, W.—An application was made on December 10th to Mr. Registrar Warmington at the London Bankruptcy Court for an order of discharge on behalf of the debtor, who failed in July, 1931. According to the report of the Official Receiver, the provable claims amounted to £5,504 and the assets had realised £535, out of which a dividend of 7s. in the £ had been paid on the preferential claims, returned at £767. The debtor commenced business in December, 1923, as a cinematograph engineer under the style of "Kingston and Lynes," and at first the business proved successful, the turnover rising to £1,000 a month. Difficulties, however, arose and delivery of his first order of cinematograph machines was not accepted. To that fact, combined with decline in his engineering business, the debtor attributed his failure and insolvency. The only fact in opposition stated by the Official Receiver was the insufficiency of assets to equal 10s. in the £ on the amount of the liabilities. Mr. G. D. Haynes, the trustee, said he was instructed by the committee of inspection not to oppose the application. The discharge was suspended for two months.

H. Cohen and **S. Cohen,** trading as the Imperial Radio Manufacturing Co., 51, Farringdon Road, E.C.—A sitting of the London Bankruptcy Court was held on December 9th before Mr. Registrar Warmington for the further public examination of these debtors, who failed last April with total liabilities of £1,773 (ranking £1,692) and net assets of £9 after allowing £49 for payment of the preferential claims. The business was started in October, 1929, and the failure was attributed to general trade depression, heavy overhead expenses, pilfering, cutting of prices through keen competition, and losses sustained under broken contracts. The examination was concluded.

W. F. Hurry (trading as the Bijou Portable Radio Co.), 157, Junction Road, Highgate, N.—This debtor appeared on December 10th before Mr. Registrar Warmington for his public examination. He failed in October with liabilities of £379 against assets of £169. The debtor stated that he attributed his insolvency to bad trade, lack of capital, and the demand made upon him for royalties. The examination was concluded.

W. G. G. Graham, electrician, Tofts Lodge, Little Baddow.—First meeting, December 17th, at 29, Russell Square, W.C. Public examination, January 6th, at the Shire Hall, Chelmsford.

P. A. Franks, electrical engineers' contractor, 5b, Bedford Square, Loughborough.—Last day for receiving proofs for dividend, December 23rd. Trustee: Mr. E. Barlow, 1, Berridge Street, Leicester, Official Receiver.

G. Burgess (Granville Burgess & Co.), electrical engineer, 27, Museum Chambers, Bury Street, London.—Discharged as from December 16th.

G. Cohen, electrical engineer, 49, Newman Street, Oxford Street, W.C.—Trustee: Mr. S. P. Child, 36 and 37, Queen Street, E.C.4, released October 28th.

P. W. Ottoway (The Victor Radio Supplies), wireless dealer, 73, Victor Street, Great Grimsby.—First and final dividend of 1s. 7¾d. in the £, payable December 17th at the Official Receiver's office, St. Mary's Chambers, Great Grimsby.

Company Liquidations

Brown's Dryers Co., Ltd.—The accounts of the liquidator, Mr. G. H. Lawton, for the period December 1st, 1930, to June 1st, 1931, show, after providing £291 for maintenance of assets, net receipts amounting to £223. Total costs and charges absorbed £40 and there is a balance of £182.

Apex Magneto Co., Ltd.—Meetings, January 14th, at the offices of Messrs. A. L. Price & Co., 8, Exchange Street, Manchester, to receive an account of the winding up by the liquidator, Mr. A. L. Price.

Mercurial Cut-Outs, Ltd.—Winding up voluntarily. Liquidator: Mr. M. Lancaster, 46, Basinghall Street, E.C.

Selectors, Ltd.—Meetings, January 11th, at 11, Waterloo Place, Pall Mall, S.W., to receive an account of the winding up by the liquidator, Mr. W. R. Sharp.

Chatteris Engineering Co., Ltd.—Meeting, January 11th, at 15, Bedford Row, W.C., to receive an account of the winding up by the liquidator, Mr. W. Driscoll.

Electricity Supply

Lighting, Domestic, Power

Aberayron (Cardigan).—COUNCIL NOT TO PURCHASE UNDERTAKING.—The Urban District Council has decided to take no action with regard to the purchase of the local power station, which is in the market.

Aberdeen.—NEW MAINS.—The Electricity Committee has approved a recommendation of the city electrical engineer that feeder cables shall be laid from the electricity works to the new sub-station in Putachieside, from which it is proposed to lay distributing mains by Netherkirkgate and St. Nicholas Street to Union Street, eastward to Castle Street, and westward to the east side of Union Bridge. The estimated cost of the work is £11,790, including the equipment of the sub-station. During the current financial year it is proposed to carry out only the work of laying the cables from the electricity station to Putachieside.

Barrow-in-Furness.—EXTENSIONS.—The scheme for the supply of electricity to Cartmel, Beckside, Haverthwark, Backbarrow, Newby Bridge, and Lakeside, has been approved by the Unemployment Grants Committee for grant purposes. Sanction to the borrowing of £4,333 in respect of h.p. lines in connection with the supply has been received from the Electricity Commissioners, who, however, have deferred dealing with the £1,600 required for l.p. mains and services until the consent of the Minister of Transport is obtained in respect of the l.p. overhead lines. The contractors have commenced the erection of the overhead lines, and plans for the l.p. lines have been prepared and submitted to the local authorities in order that the Minister of Transport's consent to their erection can be obtained.

Blackpool.—"ALL-IN" TARIFF.—The Corporation Electricity Department is to adopt the "all-in" tariff system in the New Year, with a "unit" charge of ½d. Cookers, washboilers and water heaters are also to be installed free of charge within 50 ft. of the meter.

Brighton.—WATERWORKS PUMPING PLANT.—Mr. A. B. Cathcart, the borough water engineer, recommends the erection of a pumping station at Balsdean, with electrically driven borehole pumps, at a total cost of £108,950. This recommendation was arrived at after consideration of a steam-engine and two oil-engine systems.

Burnley.—SWITCHGEAR FOR GRID SUPPLY.—The borough electrical engineer has been instructed to obtain tenders for the installation of e.h.p. switchgear required in connection with the supplemental supply of electricity from the Central Electricity Board.

MAINS EXTENSIONS.—The Electricity Committee has authorised mains extensions costing £1,000.

Burton-on-Trent.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £615 to supply the premises of Messrs. Staton & Co., at Fauld, near Hanbury.

Caterham.—ELECTRICITY CHARGES.—The Urban District Council has decided to make representations to the Ministry of Transport with a view to obtaining a reduction in the maximum prices charged for electricity in the district by the Urban Electric Supply Co., Ltd.

Chatham.—CHEAPER ELECTRICITY.—The Town Council has agreed terms with the Kent Electric Power Co., Ltd., for the extension of the company's tenure for not less than 42 years. Electricity for lighting is to be reduced from 6½d. to 6d. per kWh, and for heating from 2d. to 1½d. The rent of meters up to 10 A is to be lowered from 3s. to 2s. 6d. per quarter, and an alternative two-part tariff is to be introduced for domestic and business purposes. A hire-purchase system for installations and an assisted-wiring scheme are also to be provided. In addition the company agrees to lay cables in eight streets in Rochester, in ten at Strood, and in seven at Chatham, and when a Special Order has been confirmed further mains will be laid at an estimated cost of £35,000.

Clacton-on-Sea.—EXTENSIONS.—The Urban District Council, subject to a loan being secured, is to extend the supply of electricity to the Jay Wick Sands Estate, at an estimated cost of £2,900.

Colchester.—LOANS SANCTIONED.—The City Council has received sanction to loans of £36,000 for meters, house-wiring installations and domestic apparatus, with the promise of sanction for a further £52,000 for mains and services on receipt of information as to the length of each type of overhead line included in the statement of expenditure.

BULK SUPPLY.—The Council has arranged with the Central Electricity Board for a bulk supply of electricity at a standing charge of £3 16s. 3d. per annum per kW of maximum demand, and a running charge of 0.225d. per kWh, the latter to remain in force until the end of 1938. The terms obtained will result in the Council's paying in seven years, compared with the Board's previous offer, £12,235 less in fixed charges, and £3,132 less in running costs.

Congleton.—LIGHTING INSTALLATION IN COUNCIL HOUSES.—The Rural Council has agreed to electric lighting being installed at the Council houses at Holmes Chapel, the tenants to contribute 4d. a week towards the cost, which is estimated at £5 per house.

Douglas (I.O.M.).—MAINS EXTENSIONS.—The Electricity Committee is to extend mains to Oncham at a cost of £300.

Edinburgh.—PERMANENT FLOODLIGHTING OF THE CASTLE.—The Electricity Sub-committee of the Public Utilities Committee has approved of an estimate of £2,350 for a permanent floodlighting installation at Edinburgh Castle.

Epsom.—YEAR'S WORKING.—For the year ended March 31st last the Urban District Council's Electricity Department showed a net loss of £78 as compared with a profit of £422 in 1929-30. Mr. H. W. Watts, the electrical engineer, states that the revenue (£41,243) was lower than expected, due to the first complete year's operation of the alternative all-in rate, and that loan charges (£13,731) were considerably higher on account of mains extension schemes undertaken to relieve unemployment. Working expenses amounted to £27,874. The total capital expenditure at the end of the year was £216,255. Sales of electrical energy increased from 2,847,986 to 3,573,197 kWh and the maximum demand from 1,480 to 1,726 kW. There were 289 new consumers added during the year, bringing the total now connected to 3,039.

Gillingham (Kent).—YEAR'S WORKING.—For the year ended March 31st last the Corporation Electricity Department (engineer: Mr. H. Hall) records a total revenue of £56,143, a working expenditure of £34,292, and a net profit of £13,577. Capital expenditure during the year amounted to £19,666, bringing the total invested in the undertaking to £277,662. Electrical energy sold totalled 7,564,434 kWh, the maximum load being 2,615 kW.

Glasgow.—CHANGE OF FREQUENCY.—A complete survey has been made in connection with the change of frequency in the eastern district, and the cost is estimated at £310,000. The Electricity Committee has decided to submit the scheme to the Central Electricity Board.

MAINS EXTENSIONS.—Distributing mains are to be laid at a cost of £1,808.

PROGRESS DURING OCTOBER.—Under the Corporation Electricity Department's scheme 233 houses were wired in October making a total of 34,651, while hired appliances numbered 149, bringing the total to 20,621.

Great Yarmouth.—LOANS.—The Electricity Committee is to apply for sanction to loans of £20,000 for mains and services, £7,500 for meters, and £5,000 for wiring installations.

Hailsham.—SUPPLY IN NINFIELD DISTRICT.—The Rural District Council has decided to have houses at Ninfield wired for electric lighting, the rent to be increased by an amount which will liquidate the total expenditure in a term of seven years.

Hampton.—ASSISTED WIRING SCHEME.—The Urban District Council Housing Committee is to consider a scheme prepared by the London and Home Counties Joint Electricity Authority for the assisted wiring of houses.

NEW SUB-STATION.—The Joint Electricity Authority is to erect a sub-station in Holly Bush Lane.

Hastings.—LOAN FOR METERS.—The Electricity Committee is applying for sanction to a loan of £12,000 for meters.

MAINS EXTENSIONS.—Mains extensions are to be carried out to the parish church, church hall, rectory, and various premises at Westfield (£550); at Battle (£560); and at Sedlescombe (£182).

Japan.—NEW HYDRO-ELECTRIC STATION.—The Watashi-gawa Hydro-Electric Co. has decided to erect a 11,230-kW hydro-electric station on the Niita River in the Kochi Prefecture.

Kendal.—REDUCED LIGHTING CHARGES.—The Town Council has reduced the charge for electricity for lighting from 4½d. to 4d. per kWh.

Lichfield.—DEVELOPMENTS AT ALREWAS.—The extension of Lichfield's electricity supply to Alrewas by means of a 5½-mile line from Whittington was inaugurated on December 8th, when the Mayor (Alderman W. A. Wood) performed the ceremony of switching on the supply at the Council's new sub-station in Main Street, Alrewas. The building, which provides for future development, contains a switch cubicle controlling the 11,000-V primary circuit of a 75-KVA transformer. The apparatus was supplied by Crompton Parkinson, Ltd., and the materials for overhead lines by the Pirelli-General Cable Works.

Llanfairfechan.—APPLICATIONS FOR SUPPLIES.—The Urban District Council has received a petition from householders between Bernina and Tyddu Rhonwy, asking for supplies of electricity. The electrical engineer has been asked to prepare a scheme for the districts, together with an estimate of the cost of giving the supplies.

London.—ST. PANCRAS.—The Electricity and Public Lighting Committee recommends the extension of the l.p. switchboard at Tavistock Place sub-station, at a cost of £247, and mains extensions in various districts costing £902.

SHOREDITCH.—A further expenditure of £20,000 on free wiring installations is proposed by the Electricity Committee. To encourage the use of electricity for heating garages and similar buildings at off-peak periods the following special tariff is recommended by the Electricity Committee:—1d. per kWh between 8 a.m. and 6.30 p.m., and ½d. per kWh between 6.30 p.m. and 8 a.m., the application of this rate to be subject to the approval of the Committee.

STOKE NEWINGTON.—Sanction has been received by the Borough Council to the following loans: Mains and services, £10,000; free wiring installations, £5,000; electric cookers for hire, £2,000; and mains in connection with the Finsbury Park extension, £299.

The Electricity Committee recommends that electricity shall be supplied for heating through prepayment meters at 1½d. per kWh.

It is proposed to supply electricity to the Metropolitan Water Board's pumping station at Green Lanes at an estimated cost of £5,000.

HACKNEY.—The Electricity Committee has decided to raise loans of £96,000 for generation station extensions, £35,000 for the Urswick sub-station, and £9,000 for meters.

Lowestoft.—SUPPLY TO CARLTON COLVILLE.—The Transport and Electricity Committee recommends that application be made for sanction to a loan of £1,850 for the purpose of supplying electricity to Carlton Colville.

Nelson.—REPLACEMENT OF APPARATUS.—The Town Council has applied for sanction to a loan of £3,764, estimated excess expenditure in respect of the replacement of electrical apparatus necessitated by the change-over.

North Lincolnshire.—SPECIAL ORDER.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order authorising the Yorkshire Electric Power Co. to supply electricity in the urban districts of Brigg, Crowle, Market Rasen, Roxby-cum-Risby, and Winterton, the rural districts of Howden, Gainsborough, and Winterton, and parts of the rural districts of Tadcaster, Escrick, Riccall, Caistor, Glanford, Brigg, and Welton in North Lincolnshire and Howdenshire.

Northern Ireland.—LURGAN.—The Northern Ireland Electricity Board is to take over the electricity undertaking in Lurgan as from January 1st, 1932.

ADVISORY COMMITTEE APPOINTED.—Under the provisions of the Northern Ireland Electricity Supply Act, 1931, the Minister of Commerce has appointed an Advisory Committee to assist the Ministry in matters connected with the general improvement and development of the supply of electricity in Northern Ireland. The Minister of Commerce has designated Mr. Thomas Bailie, of Bangor, to be chairman of the Committee.

Norwich.—YEAR'S WORKING.—The accounts of the Corporation Electricity Department for the twelve months ended March 31st last, show a total revenue of £246,663, a working expenditure of £133,145, and a net profit of £25,830. The preceding year's figures were: Income, £235,612; working expenses, £128,865; net profit, £24,446. The electrical energy sold rose from 33,140,302 to 37,701,919 kWh.

Nottingham.—ELECTRICITY CHARGES.—A recommendation that meter rents should be abolished and that a minimum charge for electricity of 5s. per quarter should be made was rejected at a recent meeting of the City Council.

Oswestry.—PRICE REDUCTIONS.—The Town Council has decided to reduce the lighting charge by ½d. per kWh and the cooking rate by 1d.

Plympton (Devon).—EXTENSIONS.—The Rural District Council has received sanction from the Electricity Commissioners to the provision of electricity in the districts of Brixton, Yealmpton and Torre, and the extension is to proceed at once.

Preston.—SUPPLY TO RIBCHESTER INAUGURATED.—A supply of electricity from Preston is now available in the Ribchester district.

Retford.—EXTENSIONS.—The Town Council is to apply for sanction to a loan of £18,745 for electrical extensions in the Northern area and the ordinary development of the electricity undertaking.

Stafford.—ELECTRICITY FOR WALTON.—The Town Council has arranged to give a supply of electricity to the village of Walton by means of overhead lines.

Stratton (Cornwall).—SUPPLY IMPROVEMENTS FOR TOUGHILL.—The Rural District Council has given its consent to an application by the Bude Electric Supply Co., Ltd., for permission to erect a transmission line from Broadclose to Broomhill, in order to improve the supply to Toughill.

Sunderland.—RENEWAL OF CABLES.—The Corporation Transport Committee is to apply for sanction to spend £15,000 on the renewal of underground cables in connection with the tramway feeder system.

Swansea.—LOANS.—The Electricity Committee is to apply for sanction to loans of £200,000 for mains and services, £20,000 for meters, and £6,000 for domestic apparatus.

MAINS EXTENSIONS.—Mains extensions are to be carried out at a cost of £930.

Trimdon (Durham).—ELECTRIC LIGHTING OF PARISH.—The Parish Council is approaching the Newcastle-upon-Tyne Electric Supply Co., Ltd., with regard to the electric lighting of the parish.

Tynemouth.—SHOP-LIGHTING CONCESSION.—A number of large shopkeepers in the town have requested the Electricity Committee to fix special rates for electricity for shopkeepers in order that they may extend their lighting arrangements. The Committee has accordingly decided that the charges for large consumers who are using not less than 10,000 kWh per annum shall be £11 per kW demanded, plus 1d. per kWh for all internal lighting, with the ordinary tariff for heating, power, outside lighting, and signs.

SUPPLY TO MOOR PARK HOSPITAL.—With a view to economy the Electricity Committee has arranged a modified scheme for

providing a supply to the Moor Park Hospital at a cost of £400 instead of £900 as originally proposed.

DOCK IMPROVEMENT SCHEME.—In connection with the new supply to the docks the borough electrical engineer has been authorised to purchase cable, switchgear, &c., costing £2,140.

Wakefield.—LOAN.—The Electricity Committee is applying for sanction to a loan of £5,000 for sub-stations and transformers.

NEW SUB-STATION.—A new sub-station is to be erected at Haddingley Hill.

Winchester.—TEMPORARY BULK SUPPLY.—The City Council is negotiating with the Central Electricity Board for a temporary bulk supply from Southampton, pending the completion of the permanent grid transmission lines to the city.

Traction

Accrington.—AUTOMATIC TRAFFIC CONTROL.—The Corporation Watch Committee is considering the installation of automatic traffic signals.

Ayr.—PURCHASE OF TRAMWAY UNDERTAKING.—The Town Council has accepted the offer of the Scottish Motor Traction Co., Ltd., for the purchase of the tramway undertaking. The company, which is to substitute an omnibus service, is to pay £20,000 cash and to make an annual payment of £2,500 for ten years and £500 for eleven years thereafter. The proposed date of taking over is January 1st. The tramway undertaking has been in operation for 30 years, and last year a loss of £3,450 on the undertaking was recorded. There is an outstanding debt of £54,000.

Burnley.—RELAYING OF TRAMWAY TRACK.—The Tramways Committee is to relay the tramway track in Westgate at a cost of £1,950.

Continental.—BELGIUM.—At the present time except for a twelve-mile local line near Brussels, none of the 3,000 miles of steam railways in Belgium has been electrified. At a recent meeting of shareholders of the Belgian State Railway Exploitation Co., the chairman stated that a special commission had been appointed to consider the question of electrifying certain important sections of the system, notably the line between Brussels and Luxembourg, and that between Brussels and Antwerp. It had been found, however, that the cost of the work would amount to nearly £5,000,000, and it was considered that under existing conditions the additional traffic that might be expected would not be sufficient to cover the cost of electrification.

SWITZERLAND.—It is announced from Berne that 98 per cent. of the double tracks and 37 per cent. of the single lines belonging to the Swiss Federal Railways have now been electrified, while the electric traffic reaches 86.5 per cent. of the total traffic. Switzerland has now 2,082 km. of electrified lines. The cost of the second stage of the work of electrification which is now in progress is estimated at 450 million French francs.

GERMANY.—*Modern Transport* says that the German Government has decided to start work in the near future on the electrification of the Wansee Railway serving the south-western suburbs of Berlin. The expenditure involved amounts to 60,000,000 Rm.

Dundee.—THE TRANSPORT QUESTION.—The Transport Committee is investigating different systems of transport before deciding which is to be used on the Broughty Ferry and Monifieth route 'bus system. Mr. D. H. Bishop, the electrical engineer, estimates that the overhead equipment for a trolley-'bus system would cost £13,770, and the underground feeders and sub-stations £4,356.

Japan.—RAILWAY ELECTRIFICATION.—Provided that official permission is obtained the Tokyo Suburban Railway will start work next March on the construction of the first section of its line between the Shibuya and Kichijoji stations on the Government Electric Railway. The Mikko Mountaineering Electric Railway has decided to proceed with the construction of the second section of its line at a cost of 500,000 yen.

London.—MORE TROLLEY-'BUSES.—The London United Tramways, Ltd., is to hold a special meeting on January 5th for the purpose of approving an Order authorising the company to run trolley-'buses on an additional route in Surrey.

SWIVEL SEAT EXPERIMENT.—Reversible swivel bucket seats are being tried out on one of the L.C.C. tramcars.

Middlesbrough.—TRAMWAY ABANDONMENT.—The Northern Traffic Commissioners have given permission to the Corporations of Middlesbrough and Stockton to substitute omnibuses for trams on the route from Norton to North Ormesby after December 31st.

Newcastle-on-Tyne.—DIESEL-ELECTRIC SERVICE NEXT MONTH.—Sir W. G. Armstrong Whitworth & Co., Ltd., have issued a statement to the effect that the first regular train service of the new Diesel-electric railcars which they are manufacturing is to be started in the middle of January at Newcastle. The London & North Eastern Railway Co., which recently made successful trials with the 250-b.h.p. car is to put the car into regular service on the branch and outlying lines around Newcastle. Afterwards the car is to be used on other parts of the company's system to try it out under all conditions.

Tynemouth.—AUTOMATIC TRAFFIC CONTROL.—Four automatic traffic signals are to be installed by the Town Council at various cross-roads.

Communications

Australia.—NEW BROADCASTING STATION.—The project of the Council of Churches for the erection of a church broadcasting station has reached the stage at which the transmitting plant has been ordered, says *World-Radio*. It will be situated at Sydney and known as 2CH. It will be one of the highest powered " B "-class stations, with 1,000 W in the aerial, and its frequency will be 1,210 kc (248 metres).

WIRELESS TELEPHONE SURCHARGE.—To offset the loss on overseas telephone calls due to the adverse rate of exchange a surcharge of 2s. in the £ is now imposed on calls from Australia. A three-minute call to Great Britain costs £6 12s. and to New York £9 18s. The surcharge will be reviewed if variations in the exchange rate occur.

At a meeting of Amalgamated Wireless (Australasia), Ltd., Mr. E. T. Thirsk said a careful estimate showed that by using the beam service for telegraph messages the public had saved £650,000 since the inception of the service.

WIRELESS INTERFERENCE.—A committee representing various authorities and engineering societies has been formed in Victoria to investigate the problem of inductive interference with broadcasting services. The chairman is Professor T. H. Laby, who is dean of the faculty of science at Melbourne University.

Canada.—RADIO CONTROL.—The Judicial Committee of the Privy Council began the hearing on December 11th of an appeal by the Attorney-General for Quebec against a judgment of the Supreme Court of Canada relative to the power of the Canadian Parliament to regulate and control radio communication. Quebec claims provincial rights to limit Parliamentary jurisdiction.

Dutch West Indies.—TELEPHONY.—There is no law relating specifically to the granting of telephone concessions in the Dutch West Indies, the Governor of Curaçao being vested with complete executive authority, the granting of franchises for public utilities being one of his functions. Formerly a private company operated a telephone service at Willemstad under a concession. This expired, however, in 1927, and the Governor of Curaçao did not renew it. Instead it was determined to construct an entirely new telephone system, with public funds, and to operate it as a Government department, this having been in operation since February, 1928. The telephone system at Aruba is also operated as a Government department. On the other islands of the Dutch West Indies, Bonaire, Saba, St. Martin, and St. Eustatius, there are no public telephone systems.

Manchester.—AUTOMATIC TELEPHONY.—The new automatic telephone equipment at the Longford exchange, serving the Stretford district of Manchester, was cut over on December 12th. This is the first director-type automatic telephone exchange using single-sided racks to be opened for service in this country. The equipment was manufactured and installed for the General Post Office by Standard Telephones and Cables, Ltd.

Newport (Mon.).—RADIO EXCHANGE.—The Corporation Tramways Committee has had an application from Rediffusion, Ltd., for permission to suspend wires from and between tramway standards, or lamp standards, for which the company would pay 2s. 6d. per standard used for the first six months whilst the service of wireless relays was being inaugurated and thereafter an inclusive rental of £50 a year, the suspensions to be placed and maintained to the reasonable satisfaction of the Corporation and an indemnity policy for £1,000 to be given to the Corporation by the company to cover any claims for loss or damage.

Spain.—The British Postmaster-General announces that the Anglo-Spanish telephone service has been extended to the island of Majorca (Balearic Islands).

Switzerland.—PERSONAL TELEPHONY.—The Postmaster-General announces that personal calls are now admitted in the Anglo-Swiss telephone service. This facility, which is now available in all the Anglo-Continental telephone services, enables a caller, at a small additional charge, to book his call to a specified person at the distant end.

United States.—PROPOSED TAXATION.—Budget proposals submitted to Congress with a view to increasing revenue include the suggested imposition of special taxes on telephone calls, telegrams, cable messages, and broadcast wireless receivers.

TELETYPEWRITER SERVICE.—The American Telephone and Telegraph Co. and the Western Union and Postal Telegraph Companies are now offering to the public a nation-wide teletypewriter service, akin to the telephone service. Automatic telegraph instruments, with the standard typewriter keyboard, will be installed in the homes and offices of subscribers. All the latter will have to do is to signal a central operator who will then connect them at once with other subscribers in any part of the country. Direct two-way written " conversations " can then be carried on. Charges for the service will be on a graduated time basis. The A. T. & T. will charge about 20 cents for a five-minute local communication, whilst a five-minute call between San Francisco and New York will cost about $4.60 dollars. Guarantees of a minimum amount of business per month will be demanded from subscribers.—*Reuter's Trade Service* (New York).

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below.

Contracts Open

Australia.—MELBOURNE.—January 20th. City Council. Ring main metalclad 6,600-V switchgear. (A.X. 11210.)*
February 3rd. Totally enclosed metalclad 6,600-V switchgear. (A.X. 11211.)*

Belgium.—ANDERLECHT.—December 23rd. Régie de l'Electricité d'Anderlecht. L.p. and h.p. armoured cables. Specifications (Cahiers des Charges) for 3 fr. each, from the Hôtel Communal, 4 Rue Van Lint, Anderlecht.

BRUSSELS.—December 23rd. Société Nationale des Chemins de Fer Belges. 75 single-phase and 35 three-phase meters. Particulars from Service du Matériel, Division des Achats, Bureau 26-5, 21 Rue de Louvain, Brussels.

Egypt.—CAIRO.—January 23rd. Ministry of the Interior. 3,175 meters for Mansourah. (A.X. 11215.)
February 18th. Diesel engine driven power station (400 kVA) for Samallout. (A.X. 11209.)*
February 18th. Waterworks, with electric pumping equipment, for Samallout. (G.X. 10962.)*

Fife.—December 31st. County Council. Various works, including electric lighting installation, in connection with 48 houses. Schedules from Mr. G. B. Deas, architect, Central Chambers, Kirkcaldy (deposit £1 1s.).

Galloway.—January 15th. Galloway Water Power Co. 11,000-V overhead line between Glenlee power station and High Bridge of Dee. (See this issue.)

Guildford.—December 23rd. Corporation. Centrifugal pumps, electric motors, &c., for Bellfields sewage disposal works. Particulars (deposit £2 2s.) from the borough surveyor.

Hailsham (SUSSEX).—December 22nd. Rural District Council. Wiring houses for electric lighting, School Lane, Ninfield. Particulars from Mr. W. O. Humphrey, engineer, 17, London Road.

Halifax.—January 2nd. Tramways Committee. Electrical work at omnibus garage, Elm Wood. Specification and form of tender (deposit £2 2s.) from Mr. A. C. Tipple, borough engineer, Crossley Street.

Hamilton.—Electricity Department. E.h.p. and l.p. underground cables. (See this issue.)

India.—NEW DELHI.—January 5th. Indian Stores Department. Transformers and switchgear for the Punjab. (A.X. 11217.)*

Keighley.—December 29th. West Riding County Council. Installation of electric lighting at the Technical College. Particulars from the County Hall, Wakefield.

London.—CENTRAL ELECTRICITY BOARD.—December 18th. Construction of site works, foundation works, &c., at Cardiff and Newton Abbot. (November 20th.)

January 25th.—Construction of site works, foundation works, &c., (*a*) at Portishead and Upper Boat for the South-West England and South Wales Electricity Scheme, and (*b*) at Carlisle, Padiham and Kearsley for the North-West England and North Wales Electricity Scheme. (See this issue.)

February 15th. Central indication and telephone equipment and supervisory control equipment in the North-West England and North Wales area. (See this issue.)

ISLINGTON.—January 15th. Electricity Department. Twelve months' supply of electrical stores. (December 4th.)

Montgomery.—December 29th. Public Assistance Committee. Overhaul and rearrangement of the electric lighting plant at the Caersws Institution. (See this issue.)

New Zealand.—WELLINGTON.—January 26th. Post and Telegraph Department. 300 lamp jacks and 1,000 alarm fuses. (A.X. 11203.)*
January 27th. Telephone cords. (A.X. 11202.)*
January 28th. 100 automatic dials. (A.X. 11201.)*
February 8th. 35,000 telephone dry cells. (A.X. 11212.)*
February 23rd. Public Works Department. Four 1,000-kVA single-phase transformers, with automatic voltage regulating equipment. (A.X. 11213.)*
February 9th. Control and power cables for Waitaki power station. (A.X. 11214.)*

Northern Ireland.—ELECTRICITY BOARD.—January 18th. 33-kV overhead transmission line. (December 11th.)

Renfrew.—County council. Various works, including electric lighting, in connection with a housing scheme. Schedules from the county clerk, County Buildings, Paisley.

Roxburgh.—December 26th. County Council. Electric lighting for housing scheme. Schedules from county clerk, County Offices, Newton St. Boswells.

South Africa.—RAND WATER BOARD.—January 8th. Horizontal centrifugal pump, electric motor and other electrical gear. (G.X. 10941.)* Vertical spindle centrifugal pump and electric motor. (G.X. 10942.)*

CAPE TOWN.—January 6th. Electricity Department. Capacitor equipment. (A.X. 11197.)* Globes, reflectors and galleries for electric street lamps. (B.X. 7199.)*

DURBAN.—January 4th. Corporation. Arcing ground suppressor for 33,000-V overhead transmission. (See this issue.)

Turkey.—ANKARA.—December 22nd. Ecole Supérieure du Génie. Electrical instruments and apparatus. (A.X. 11207.)*

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Barrow-in-Furness.—Town Council. Accepted. Switchgear (£173).—Crompton Parkinson, Ltd.

Bedford.—Electricity Committee. Recommended. Erection of l.p. distribution lines in the rural area.—R. M. Russell.

Bexley.—Urban District Council. Accepted. Cables (£3,705).—Johnson & Phillips, Ltd. Last year the contract went to a Continental firm.

Douglas (I.O.M.).—Highways Committee. Accepted. Electric lighting installation at Lake Yard depôt.—Lawton & Co., Ltd.

Evesham.—Rural District Council. Accepted. Installation of electric lighting at houses at Offenham, Bretforton and Sedgeberrow (£297).—H. C. Billworth.

Glasgow.—Corporation Electricity Committee. Accepted. Plant and appliances required in connection with the change of frequency under the Central Scotland scheme: Seventy motors and three fans (£761), British Thomson-Houston Co., Ltd.; motor (£677), English Electric Co., Ltd.; two motors reconditioned, five new motors, and one motor, dual frequency (£1,634), Metropolitan-Vickers; thirty-nine new motors, five fans, and one reconditioned motor (£847), G.E.C.; forty-seven motors and eight fans (£1,583), Harland Engineering Co., Ltd.; four condensers with switchgear (£2,300), Telegraph Condenser Co., Ltd.; twelve new motors and one motor replaced (£236), Crompton Parkinson, Ltd.
Corporation Public Assistance Committee. Recommended. Electrical fittings, &c., for twelve months.—J. Drummond & Son.
Corporation Transport Committee. Accepted. Points and crossings.—Edgar Allen & Co., Ltd. Insulated bolts.—W. C. Yuille & Co., Ltd. Tramway poles.—Stewarts & Lloyds, Ltd.
Corporation Police Committee. Accepted. Electrical installation in houses at various police offices (£135).—R. Thomson.

Gravesend.—Health Committee. Recommended. Wiring the Isolation Hospital.—A. F. Hornsby & Co.

Hawarden.—Rural District Council. Accepted. Installation of power plugs at 116 houses at East Saltney (£175).—S. B. Brody.

Liverpool.—Mersey Tunnel Joint Committee. Accepted. Electrical plant to operate the ventilation machinery to be installed in the tunnel.—Metropolitan-Vickers Electrical Co.
Port Sanitary and Hospitals Committee. Recommended. Two electric cooking ranges at the Cleaver Sanatorium and private automatic telephone system at Alder Hey Hospital.—Automatic Telephone Manufacturing Co.

London.—ST. PANCRAS.—Contracts and Stores Committee. Recommended. Cable for the electricity undertaking (£1,184).—Hackbridge Cable Co., Ltd. Extension of the l.p. switchboard at Tavistock Place sub-station (£247).—J. G. Statter & Co., Ltd.
L.C.C.—Housing Committee. Wiring and fittings for electric lighting in three blocks of dwellings at Glebe Estate, Camberwell.—Hall & Stinson (accepted), £1,468; City Electrical Co., £1,541; W. H. Gaze & Sons, £1,594; Harland & Wolff, £1,628; H. J. Cash & Co., £1,732; Coleby & Co., £1,781; A. Dean & Co., £1,878; Pinching & Walton, £1,926; Burdette & Co., £2,213.
Highways Committee. Accepted. Conductor rails (£6,795).—Frodingham Iron & Steel Co., Ltd. Track rails and fishplates (£30,791).—Dorman, Long & Co., Ltd.

Reading.—Town Council. Accepted. Automatic electric traffic signals (£797).—Chance Bros. & Co., Ltd.

Strood.—Rural District Council. Accepted. Supply and laying mains and electrical installation at the Isolation Hospital, Gravesend.—Alpha Mfg. & Electrical Co., Ltd.

Swansea.—General Purposes Committee. Accepted. Installation of electric thermal storage plant at the new civic buildings (£13,711).—G. N. Haden & Sons, Ltd.

Ware.—Rural District Council. Accepted. Wiring twenty-eight houses at Stanton for electric lighting (£147).—W. F. Hunt.

Forthcoming Events

Institution of Electrical Engineers (*London Students' Section*).—Friday, December 18th. Institution, London. 6.15 p.m. "The Theory and Design of the Gramophone Pick-up." Mr. W. D. Oliphant. (*North-Eastern Students' Section*).—Friday, December 18th. Armstrong College, Newcastle-upon-Tyne. 7.15 p.m. "The Design of D.C. Machines for Moderate Outputs." Mr. G. Waters.

Junior Institution of Engineers.—Friday, December 18th. Institution, London. 7.30 p.m. "The Development of the Talking Picture." Mr. W. Harris.

Birmingham Electric Club.—Friday, December 18th. Grand Hotel, Birmingham. 7 p.m. Annual meeting.

Manchester Electro-Harmonic Society.—Friday, December 18th. Waldorf Hotel, Manchester. 7 p.m. Smoking concert.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of the makers of the following:—

VEROTAX earth clips.
FURNACE electric fire.
CRYSTAX or CRYSTEX glassware and fittings.
Machines for the production of all parts of small dry batteries.
E.E. motor starter (purchased 25 years ago).

Notes

London Housing Societies' Exhibition

At the London Housing Societies' Exhibition held, under the title of "New Homes for Old," in the Central Hall, Westminster, the Electrical Association for Women, in conjunction with the Electrical Development Association, exhibited a model of an existing all-electric working-class kitchen. The electrical apparatus included a cooker, water-heater, kettle, iron, fire, and a portable wash-boiler. The cost of running such a kitchen was given as 4s. 3d. a week, including the hire of the apparatus.

Talks on electrical subjects of practical interest to women were given daily by Miss C. Haslett, C.B.E., Miss V. Norvick, Miss P. Atkinson, Miss V. Brice, and Mrs. H. Dover, B.Sc. Each talk was followed by the exhibition of a film "The Blight of Coal Smoke and a Cure."

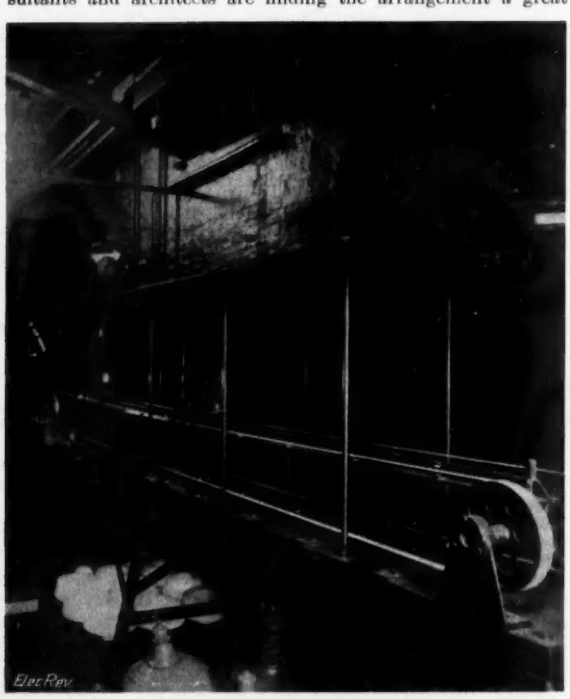
Depreciation of Power Station Plant

At the recent N.E.L.A. Convention Mr. W. S. Monroe (of Messrs. Sargent & Lundy) said that at any average capacity factor up to 45 per cent., fixed charges taken at 12½ per cent. on the capital expenditure are a larger item than production costs. The fixed charges include interest at 6 per cent., taxes and insurance at 1½ per cent., and depreciation at 5 per cent. From figures obtained from the Commonwealth Edison Co. of Chicago, Mr. Monroe considers 5 per cent. of the original cost set aside each year during the useful life of the plant should amply cover depreciation, and that high-pressure plant will have at least as long a useful life as had the older types.

Technical advance in the future is not likely to be so rapid as in the past ten years. He further states that developments of the mercury-arc rectifier and the thyratron tube are likely to cause changes that will make it necessary to write off some types of equipment within a few years.

Ponder's End Lighting Laboratory

A few days ago we visited the Ponders End works of the Edison Swan Electric Co., Ltd. The lighting laboratory there is said to be well in advance of American practice. It has been equipped for testing not only the company's own lamps, but anything used in connection with a lamp of any make for any third party. We were informed that consultants and architects are finding the arrangement a great convenience. The outstanding feature was the large universal photometer which is claimed to be unique. This was described in our issue of October 30th, but the apparatus should be examined in detail to enable its full possibilities to be realised. The Ediswan staff now includes the old B.T.H. lighting men, and we were pleased to come across many of those who were doing pioneer work 20 years ago, including Mr. Evans, the works manager, and Mr. H. C. Wheat, the chief engineer.



The Ediswan Photometer

Appointments Vacant

Outside overhead lines engineer and linesman for the North-West Midlands Joint Electricity Authority.

(See our advertisement pages to-day.)

The Physical Exhibition

The twenty-second annual exhibition of scientific instruments and apparatus arranged by the Physical and Optical Societies will be held on January 5th, 6th, and 7th, at the Imperial College of Science and Technology, South Kensington, S.W.7. It will be open in the afternoons from 3 p.m. to 6 p.m., and again in the evenings from 7 p.m. to 10 p.m. Tickets may be obtained from the Exhibition Secretary, the Institute of Physics, 1, Lowther Gardens, Exhibition Road, S.W.7. Admission on January 7th will be free, without ticket.

Some New Technical Terms

Even in these difficult times the life of the engineer is occasionally lightened by a spark of unexpected humour. An inquiry from overseas provided such a spark the other day. The prospective buyer began his inquiry by specifying :—

> One motor with potency of 100 h.p. in continuous work, for crude oil, with 300 r.p.m. (no more) of two cylinders horizontals. The drum of this motor for command by belt should have 72 inches of diameter and a ray (beam) not inferior to 14 inches. The regulator should not permit the variations of velocity superior to 3 per cent.

The "potency" of the "dynamos of continual current" having been duly given (the "potency," by the way, being far too big for the engine) the inquiry went on to specify :—

> Reostates of proper excitation to be mounted on the stand or frame of distribution, rails, dandys (stretchers) and drums for command by belt with 450 millimetres of diameter and 400 millimetres of ray.

The inquirer then plunged still further :—

> Equilibrators or diversors of tension . . . . with the respective reostates of starters and regulators of camp proper to be mounted on frames of distributors.

Then, as a *cri-du-coeur*, the specification implored the tenderer in the following terms :—

> *Observation:* All the dynamos should be provided of exterior cushions in the extremity of the axle on the side of the drum.

It was, however, under the heading of "Frames of distribution in black stone polished" that the inquirer really touched the heights. After specifying instruments such as "amperimeters shunted," the "frames of distribution" were to be equipped with :—

> Three interruptors simple of razor for the bar of equalisation of the work of dynamos in parallel . . . .
> Three bipular interruptors of razor . . . .
> Collocation of three camp regulators for the dynamos.
> Two interruptors bipolars of 300 amperes sharp to join the current of the dynamos to the tension equilisators . . .
> Collocation of two reostates of starters to the equilisators . . . .
> Collocation of two regulators of camp to the same . . . .
> Two bipolar commuters of six directions for the circuits of the shunts of the amperimeters.

Finally, the tenderer was warned that the "frames" should be "completely enclosed with iron wire and provided at one of the extremities laterals with one door under lock."

And if the tender, now speeding on its way overseas, should not conform to the inquirer's ideas, it is hoped that he will not attempt to express himself in English.

Mining Electrical Engineers' Dinner

The annual dinner and dance of the South Wales branch of the Association of Mining Electrical Engineers is to be held on December 19th at the Royal Hotel, Cardiff, at 6.15 p.m.

Lamps for Colliery Horses

In the report for 1930 under the Coal Mines Act for the Swansea district it is stated that Mr. Phillips, inspector of horses in mines for the division, has carried out numerous trials with various electric safety lamps to ascertain the best position for a light to be fixed to illuminate the road for the horses employed in collieries. As a result he has concluded that the best place to fix the light is on the bottom of the horse's collar and that the most suitable illumination is given by a lamp fitted with a prismatic glass and plated reflector.

An Outstanding Scientific Achievement

Speaking as the principal guest of the Batti-Wallahs' Society at its luncheon last Tuesday, Sir James Jeans, F.R.S., said that there were six outstanding events in the whole history of science, considered in relation to their influence on human thought. These events were: (1) The proof by Copernicus that the earth was not the centre of the universe; (2) the realisation that the universe was governed by natural law, due to Sir Isaac Newton; (3) the discovery of the relation of man to nature, due to Darwin; (4) the discovery of Röntgen rays and Becquerel rays, the isolation of the electron, the theory of cosmic radiation and the quantum theory, all between 1895 and 1900, with Sir J. J. Thomson and Plünck as outstanding names; (5) Einstein's relativity theory in 1905; and (6) in 1931, Sir Arthur Edington's measurement of the mass of the universe at 1.93×10^{79} times the mass of a proton. This mathematical equation was shown to agree within 20 per cent. of the result anticipated by observing at Mount Wilson the rate of recession of the nebulæ, *viz.*, 12,300 miles per sec. Sir Arthur's work might have greater influence on thought than any previous scientific discovery.

I.E.E. (North-Western Centre) Dinner

The annual dinner of the North-Western Centre of the Institution of Electrical Engineers will be held on January 19th at the Midland Hotel, Manchester.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. R. Liddelow, commercial manager of the Victorian Electricity Commission, has been appointed manager. This is a new post, and Mr. F. W. Clements, chairman of the Commission, in announcing Mr. Liddelow's appointment, said the manager would be the senior administrative officer, and that in him would be vested responsibility for giving effect to the decisions of the Commission and the policy which it adopted. Mr. Liddelow joined the Commission as secretary soon after its creation in 1919, and retained that post until 1928, when, after a tour abroad, he was appointed commercial manager.

Mr. Andrew Gray, who has retired from Marconi's Wireless Telegraph Co., Ltd.

Mr. Andrew Gray has retired from the position of technical general manager to Marconi's Wireless Telegraph Co., Ltd. Mr. Gray joined the company in 1899, his name coming eighth on the veterans' list. He had previously served with the West India and Panama Telegraph Co., Ltd. (1893-1898), first as assistant and afterwards as chief electrician in charge of 4,000 miles of cables. He introduced the Marconi system to the Hawaiian Islands in 1900, organising the telegraph working and training the native operators of the Inter-Island Telegraph Company of Honolulu. He was appointed chief of staff to Marchese Marconi in 1901, and in that capacity organised the working of the ship and shore wireless communication system of the Marconi International Marine Communication Co., Ltd. The regulations for the conduct of this marine telegraphy which he then introduced anticipated in a great measure the regulations of the first International Radio Convention. Mr. Gray has to his credit a number of patents, and among these is the "Gray" tubular steel mast which superseded the early wooden ship type of mast for supporting wireless aerials. He was appointed chief engineer of the parent company in 1910, joint general manager in 1923, and technical general manager in 1928. He is a member of the Institution of Electrical Engineers, and an associate member of the Institution of Civil Engineers.

Mr. A. E. Pycraft, chief clerk of St. Pancras Electricity and Public Lighting Department, is to retire under the Borough Council's superannuation scheme. Mr. Pycraft, whose age is 69, has served the Council for 40 years, and his period of service has been extended, the last occasion being for one year from January 28th, 1931. The Parliamentary and General Purposes Committee now recommends that as Mr. R. Lee, the newly appointed electrical engineer and manager of the undertaking, will be taking up his duties on January 4th next, Mr. Pycraft's services should be retained until March 31st, 1932, in order that he may assist Mr. Lee in obtaining a knowledge of the details of the working of the department.

Mr. F. M. Long, city electrical engineer of Norwich, who, as announced in our last issue, terminates his connection with Norwich Corporation on June 30th next, informs us that he has been appointed to the board of the Mid-Lincolnshire Electric Supply Co., which has recently been formed to take over the Special Orders granted to Mr. Borlase Matthews. Mr. Long will have completed 40 years with the Norwich undertaking, the first ten of which were with the Norwich Electricity Co., which sold the undertaking to the Corporation. The output was then 1,500,000 kWh, while this year it will be over 40,000,000 kWh.

Mr. Matthew Campbell, the Ayrshire representative of Messrs. Mavor & Coulson, Ltd., has retired after nearly 30 years' service with the company, and has been presented with a Westminster chiming grandmother clock and a canteen of cutlery. To mark the occasion, Mr. Campbell was entertained to supper by the staff, when Major Mavor, in presenting the gifts, referred appreciatively to the pioneer work he had done in installing electrical coal-cutting machinery in the days when prejudice against it was strong.

Mr. B. J. Samels, of the L.C.C., vice-chairman of the London and Home Counties Joint Electricity Authority and a former mayor of Hammersmith, has been elected chairman of the Metropolitan Boroughs Standing Joint Committee for the ensuing year.

Mr. J. Lomas, electrical engineer to the Mirfield Urban District Council, who has retired after 26 years' service, has been presented by his colleagues and officials of the Council with a barometer and smoking cabinet.

Mr. T. Malcolm Ritchie, director of manufacture of the Associated General Electric Industries, Ltd., has, according to the *Electrical Trader of Australasia*, accepted the presidency of the Electrical Manufacturers' Association, New South Wales.

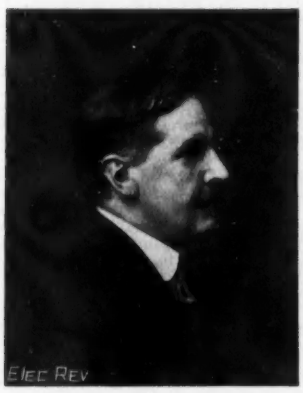
Mr. J. E. McLaren has succeeded Mr. G. Dowding as manager of the Birmingham office of Messrs. Buck & Hickman, Ltd.

Mr. Thomas H. M. Swinburne, of Altrincham, was married on December 9th to Miss S. A. Edwards, of Stainland, Yorks.

Mr. H. W. Roberts has been appointed manager of the new branch of the General Electric Co., Ltd., at Blackburn.

Obituary

Mr. F. J. Moffett.—We learn with regret that Mr. Francis Joseph Moffett, B.A., M.I.E.E., and a member of the Association of Consulting Engineers, passed away on December 9th. Mr. Moffett, whose loss will be keenly felt by electrical engineers and others in the Midlands area, took a very prominent part in electrical affairs. He was chairman of the South Midland Centre of the Institution of Electrical Engineers in 1925-1926. Mr. Moffett, who was born in 1869, was a consulting engineer practising in Birmingham from 1908 until 1921 with Mr. N. B. Rosher, designing and supervising electrical schemes, and inspecting and testing plant for the Dominions, Crown Colonies and foreign countries. When, in 1921, Mr. Rosher retired from the firm, Mr. Moffett was joined by Mr. F. H. Mann. The School of Electrical Engineering in Hanover Square, London, was the scene of his early education and training. Engineering apprenticeship followed, also employment with the National Telephone Company, with the Woolwich Electricity Supply Co., and as chief electrical engineer to the colony of Southern Nigeria for superintending the erection of the Lagos power station. Afterwards he was with Messrs. Preece & Cardew for the electrical equipment of H.M. Dockyards and other operations. It was from this engagement that he entered into the partnership with Mr. Rosher already mentioned. At the time of his death he was sole partner in the firm of Moffett, Rosher & Mann.



The late Mr. F. J. Moffett

Will.—Mr. H. A. Bealby, of Worksop, Notts., principal of R. Shaw & Son, ironmongers and electrical engineers, left £55,650 (net personalty £16,521).

Rural Electrification in France

A national Rural Electrification Congress was held in Paris recently, previous ones having been held in Lyons in 1924 and in Paris in 1926. According to *The Times* considerable progress has been made during the last seven years. The main part of the French scheme, which was begun 10 years ago, has been carried out, but of late there has been difficulty in financing the distribution system in some of the more sparsely occupied areas. Electric light is welcomed universally, but on this basis alone distribution lines do not pay. Ploughing and threshing are profitable in some districts, but farm power users have not received much attention. This led the congress to emphasise the importance of dealing with water pumping, irrigation, and drainage—all large consumers of electric power. The suggestion was also put forward that the possibilities of small power uses on farms should be investigated on a scientific basis by one of the Government Departments.

During the last 10 years, some 45,000 acres have been ploughed electrically, and it has been established that not only is the work carried out more cheaply by electricity, but it is also better done, more particularly as regards uniform depth of ploughing, regardless of any alteration in the nature of the soil. A 40-h.p. electric machine will, according to the depth required, plough 750-1,500 acres a year. In France certain electricity supply undertakings hire out electric ploughs on contract.

Apparently French overhead-line engineers are as dissatisfied with their official regulations as are English engineers. The rural consumers complain of high prices of electricity which are due, it is explained, to insufficient use of the lines. The view was strongly expressed that the Government should give further facilities, so that the agricultural credit banks could more easily finance electricity distribution systems and electric plough equipments, especially in the initial stages of operation.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Dailux Electrical Co., Ltd.—Private company. Registered December 11th. Capital £1,000 in £1 shares. Objects:—To carry on the business of manufacturers of, agents for and dealers in electrical and artificial lighting apparatus, fittings, signs and accessories, &c. The directors are:—J. Cowper, 21, Dean Street, Newcastle-on-Tyne; and A. L. Armstrong, J.P., 42, Percy Park, Tynemouth. Solicitor: A. Burnett, 52, Dean Street, Newcastle-on-Tyne.

Electrobak, Ltd.—Private company. Registered December 11th. Capital £1,000 in £1 shares. Objects:—To carry on the business of general, constructional, mechanical, motor, electrical and oil fuel engineers, manufacturers of and dealers in machinery, electrical plant, &c. The directors are:—P. H. Leicester, Sandcliffe, Haslingden, engineer (managing director); and H. Bancroft, "Turfoote," Whalley Road, Accrington, engineer. Secretary: H. Bancroft. Solicitor: R. Hudson, St. James' Chambers, Accrington.

Victoria Radio Co., Ltd.—Private company. Registered December 11th. Capital £100 in £1 shares. Objects:—To carry on the business of manufacturers of and dealers in all kinds of electrical and other instruments and components in connection with wireless, telegraphy and telephony, television, &c. The subscribers are:—H. Diggle and E. Boden, both of 165, Lord Street, Southport. The first directors are to be appointed by the subscribers. Secretary: E. Boden.

Violite, Ltd.—Private company. Registered December 10th. Capital £6,000 in £1 shares (3,000 15 per cent. cumulative preference and 3,000 ordinary). Objects: To carry on the business of manufacturers of and dealers in gas- or vapour-filled filament or electric discharge vessels for lighting and other purposes, vacuum, light-sensitive, thermionic, electronic, magnetic, electro-magnetic, mechanical, X-ray, violet ray or chemical apparatus of all descriptions, electrical, chemical and mechanical engineers, &c. The subscribers are: W. E. N. Potts, 145, Dudden Hill Lane, Neasden, N.W.10; and S. Smith, "Wilston," Edgware Road, Cricklewood, N.W.2. Secretary: S. Smith. Registered office: 17, Dorset Square, N.W.1.

F. E. Godfrey (Radio), Ltd.—Private company. Registered December 9th. Capital £1,000 in £1 shares. Objects: To adopt an agreement with F. E. Godfrey, and to carry on the business of manufacturers of and dealers in radio, television and electrical apparatus, gramophones, and other goods in connection with the sound-producing, musical, wireless, electrical and engineering trades and industries, electricians, &c. The subscribers are: H. D. Williams, 65, Elmers Road, S.E.25; and J. E. Barrier, 3, Ribblesdale Road, Streatham Park, S.W.16. The first directors are to be appointed by the subscribers. Solicitors: Mayo, Elder & Rutherfords, 10, Drapers Gardens, E.C.2.

Coventry Electrical & Radio Services, Ltd.—Private company. Registered December 9th. Capital £100 in £1 shares. Objects: To acquire for cash or mortgage debentures of the company certain loose assets from W. Seaton which form part of the business of an electrical, motor and wireless engineer and dealer carried on by him as "Electrical & Radio Services," in Melbourne Road, Spon End, Coventry, with branches at Hinckley and Nuneaton. The directors are: W. Seaton, 119a, Abbey Street, Nuneaton (chairman); and F. Mather, 10, Turner Street, Leicester. Registered office: Melbourne Road, Spon End, Coventry.

Martin's Shades, Ltd.—Private company. Registered December 8th. Capital £1,000 in £1 shares. Objects: To acquire the assets of the business carried on by Lily Roberts as "Martins," lamp-shade manufacturers, at 6, Hardman Street, Liverpool, and to carry on the business of manufacturers of and dealers in lamp shades, electrical and wireless goods, art dealers, &c. The directors are: Lily Roberts (permanent), 58, Russian Drive, Liverpool; W. Lowe, 1, Silverdale Terrace, Garmoyle Road, Liverpool; and H. S. Lipson (permanent managing director), 7, Breckside Park, Liverpool. Registered office: Columba Works, Green Lane Liverpool.

British Talkatome, Ltd.—Private company. Registered December 9th. Capital £1,000 in £1 shares. Objects: To adopt an agreement with J. A. Woodhams and H. Andrewes, and to carry on the business of manufacturers of and dealers in wireless receiving and transmitting apparatus, instruments and accessories. The first directors are: H. Andrewes, 4, St. Mary's Crescent, Hendon, N.W.4; and J. A. Woodhams, 2, Babmaes Mews, Wells Street, S.W.1. Registered office: Wells Street, Jermyn St., S.W.

T. Withers, Ltd.—Private company. Registered December 8th. Capital £1,000 in £1 shares. Objects: To acquire the business of an electrical wholesaler now carried on by T. Withers. The permanent directors are: V. J. Fantham, 1, Bellevue Avenue, Shenstone Road, Birmingham; and T. Withers (chairman and managing director), 50, Thursfield Street, West Bromwich. Registered office: 50, Thursfield Street, West Bromwich.

Electro Radio Co., Ltd.—Private company. Registered in Dublin on December 9th. Capital £1,000 in £1 shares. Objects: To carry on the business of wireless engineers, manufacturers of and dealers in wireless apparatus, &c. The subscribers are: F. C. Moiselle, 20, Harolds Cross Road, Dublin; and T. Jackson, "Farmleigh," Stillorgan, Co. Dublin.

New Southgate & District Radio & Accumulator Service, Ltd.—Private company. Registered December 1st. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless apparatus, fittings and accessories, electrical accumulators, &c. The directors are: C. E. Howarth, 108, High Road, New Southgate, and Edith E. Carwardine, 26, Mary Place, Notting Hill, W.11. Registered office: 102, High Road, New Southgate.

Returns of Electrical Companies

Notting Hill Electric Lighting Co., Ltd.—Satisfaction to the extent of £200,000 on or before October 31st, 1931: (1) of trust deed dated July 12th, 1900, securing £100,000 4 per cent. joint debenture stock of the Kensington & Knightsbridge Electric Lighting Co., Ltd., and the Notting Hill Electric Lighting Co., Ltd., and registered September 30th, 1908; (2) of charge dated November 18th, 1902 (supplemental to trust deed of July 12th, 1900), securing a further £50,000 like stock and registered December 5th, 1902; and (3) of charge dated November 2nd, 1904 (supplemental to trust deeds of July 12th, 1900, and November 18th, 1902), securing a further £50,000 like stock and registered November 16th, 1904.

Kensington and Knightsbridge Electric Lighting Co., Ltd.—Satisfaction to the extent of £200,000 on or before October 31st, 1931: (1) of trust deed dated July 12th, 1900, securing £100,000 4 per cent. joint debenture stock of the Kensington and Knightsbridge Electric Lighting Co., Ltd., and the Notting Hill Electric Lighting Co., Ltd., and registered September 23rd, 1908; (2) of charge dated November 18th, 1902 (supplemental to trust deed dated July 12th, 1900), securing a further £50,000 like stock and registered December 5th, 1902; and (3) of charge dated November 2nd, 1904 (supplemental to trust deeds dated July 12th, 1900, and November 18th, 1902), securing a further £50,000 like stock and registered November 16th, 1904.

Airedale Electrical & Manufacturing Co., Ltd.—Satisfaction in full on September 18th, 1931, of debenture in favour of the Bank of Liverpool and Martins, Ltd., dated November 28th, 1923, and registered December 1st, 1923. (According to the register of mortgages, the debenture registered December 1st, 1923, originally secured moneys not exceeding £850.)

Rowlands Electrical Accessories, Ltd.—Capital £5,000 in 3,000 preference and 2,000 ordinary shares of £1. Return dated November 6th, 1931. 2,019 preference and 1,161 ordinary shares taken up. £3,180 paid. Mortgages and charges: £2,260 first and £1,500 second debentures.

Halcyon Wireless Co., Ltd.—F. E. Bendall, of Midland Chambers, Warwick Passage, Corporation Street, Birmingham, was appointed receiver and manager on November 20th, under powers contained in debenture dated June 25th, 1930.

Restlight, Ltd. (formerly Halstead, Hanby & Co., Ltd.).—M. D. Booth, of 40-43, Norfolk Street, W.C.2, was appointed receiver and manager on November 26th, under powers contained in debentures dated November 4th, 1930.

G. S. Hawker, Ltd.—Debenture, dated November 26th, 1931, to secure £400, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: D. M. Thomas, "Elsmont," Court Hill, Chipstead, Surrey.

Sky Signs, Ltd.—Capital £1,500 in 1,000 preference and 500 ordinary shares of £1. Return dated March 6th (filed October 17th), 1931. All shares taken up. £1,000 paid on 1,000 preference shares. £500 considered as paid on 500 ordinary shares. Mortgages and charges, nil.

Bristol Wireless, Ltd.—Capital £100 in £1 shares. Return dated June 15th, 1931. All shares taken up. £100 paid. Mortgages and charges, nil.

Telephones and Accessories, Ltd.—Capital £3,000 in £1 shares. Return dated December 31st, 1930 (filed November 11th, 1931). 1,262 shares taken up. £662 paid, £600 considered as paid. Mortgages and charges, £150.

Fluor Light, Ltd.—Capital £1,000 in 10s. shares. Return dated December 31st, 1930 (filed October 5th, 1931). 803 shares taken up. £401 10s. paid. Mortgages and charges, nil.

G. H. Stevens & Co., Ltd.—Capital £600 in £1 shares. Return dated March 31st (filed October 20th,), 1931. All shares taken up. £600 paid. Mortgages and charges, nil.

Rolls Caydon, Ltd.—Issue on October 28th of £1,700 first mortgage debentures, part of a series already registered.

Lotus Radio, Ltd.—Debenture dated November 16th, to secure £20,000, charged on land at Old Swan, Liverpool, and the company's undertaking and property, present and future, including uncalled capital. Holder: Branch Nominees, Ltd., 15, Bishopsgate, E.C.

J. Dyson & Co., Ltd.—Capital £20,000 in £1 shares. Return dated August 20th, 1931. 17,100 shares taken up. £9,100 paid. £8,000 considered as paid. Mortgages and charges, nil.

Pacific & European Telegraph Co., Ltd.—Capital £100,000 in £10 shares. Return dated August 11th, 1931. All shares taken up. £100,000 paid. Mortgages and charges, £66,500.

City Electrical Appliances, Ltd.—Capital £5,000 in £1 shares. Return dated August 6th, 1931. 2,187 shares taken up. £2,160 15s. paid, leaving £26 5s. calls unpaid. Mortgages and charges, nil.

Macfarlane Electrical Co., Ltd.—Capital £3,000 in £1 shares. Return dated August 21st, 1931. All shares taken up. £3,000 paid. Mortgages and charges, nil.

Kent Bros. Electric Wire Co. & E. H. Phillips, Ltd.—Capital £15,000 in 11,500 "A" and 3,500 "B" shares of £1 each. Return dated October 10th, 1931. 11,500 "A" and 2,300 "B" shares taken up. £2,300 paid. £11,000 considered as paid. Mortgages and charges, £45,533.

J. W. Scott & Co., Ltd.—H. J. E. Batchelor, 44, Above Bar, Southampton, was appointed receiver on December 4th, under powers contained in debenture dated June 5th, 1931.

Leonard J. Ive, Ltd.—Particulars filed of £1,000 debentures authorised December 3rd, 1931, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

City Notes

The India Rubber, Gutta Percha & Telegraph Works Co., Ltd., held its annual meeting on December 15th, Sir John Ferguson (chairman) presiding. In presenting the report and accounts (ELECTRICAL REVIEW, December 11th, p. 900) the chairman, before dealing with the business of the meeting, referred to the death in February last of Mr. W. E. Gray, joint managing director, and the retirement of Mr. T. Sloper, owing to ill-health. The trading for the period under review showed a marked improvement on that of the previous year, yet there was a loss of £51,593, as compared with £95,977 in the previous year. The period had been one of extreme difficulty to everyone engaged in the industry, and the depression had not only become more acute, but had extended, so that practically every country had come under its influence. The prosperity of the company largely depended upon that of industry in general in view of the fact that many of its products were utilised in the carrying on of other industries. The depression had not only resulted in a decreased demand for the products which the company supplied to industry, but had also indirectly reacted upon the demand for the products manufactured for public consumption, on account of the decrease in the purchasing power of the public. A large proportion of the loss had been caused by the continued fall in the price of raw materials, and although the turnover in money of their Silvertown works had decreased by about 10 per cent. compared with the previous thirteen months, the trading showed a substantial improvement. That had been made possible by decreases in overhead expenditure, the total reduction of which amounted to about £91,000. Following the decision to close the Burton factory and to transfer the plant to Silvertown, involving the removal of machinery, the rearrangement of certain shops, and the reconditioning of buildings, etc., plans for that work had commenced at the end of June, and now all the production plant from Burton was installed and was mostly in operation. Their Persan undertaking had had to face extreme difficulties, but considerable economies had been effected. Their foreign branches had also suffered from the depression. The sale of their Palmer motor tyres showed a substantial increase, and their golf balls were becoming increasingly popular. The reorganisation of all sections of the business had continued throughout the period and was still continuing. The report and accounts were adopted.

Crompton Parkinson, Ltd., report a net profit of £100,021 for the fifteen months ended September 30th last, as compared with £103,614 for the year 1929-30, to which is added £60,708 brought in making £160,729. It is proposed to transfer £15,000 to general reserve and to pay a final dividend on the ordinary and "A" ordinary shares of 18¾ per cent. actual, less tax, making the total distribution for the period 30 per cent. The balance carried forward is £57,943. The report states that the period has been one of exceptional difficulty owing to the depressed state of trade, both at home and abroad, and the directors consider the results shown to be satisfactory. During the period the company acquired and developed an interest in a lamp manufacturing concern. It was not anticipated that profits would arise from this source during the preliminary period covered by the accounts, but the directors are satisfied with the progress made in establishing the new lamp. The date of the balance-sheet coincides with a condition of extreme disturbance of foreign exchanges and of depression in British Government securities. The directors have therefore thought it prudent to appropriate a sum of £20,000 from the general reserve, of which £5,000 has been applied in reduction of the book value of British Government securities which now stand at less than market value, and the balance of £15,000 has been carried to a specific reserve against any losses on foreign exchanges which may arise. Meeting: To-day (Friday).

The Ceará Tramway, Light and Power Co., Ltd., held its annual meeting on December 11th, Mr. E. H. Trenow (chairman) presiding. In presenting the report and accounts (ELECTRICAL REVIEW, December 4th, p. 865), the chairman said that the year under review showed increased earnings from the tramways and the light and power department, but the omnibus receipts showed a distinct falling off. A 2,000-kW generating set had been delivered at Ceará, and was now in operation. The new plant provided them with a substantial margin of power over all existing needs, and would enable them considerably to increase the output of electricity for lighting and power, and meet the future requirements of Ceará for some time to come. During the past ten years they had exper.ded £112,000 in additions to plant and permanent works. Having regard to the present state of the finances of Brazil and the uncertainties regarding exchange, the board could not recommend the declaration of a dividend. The report and accounts were adopted.

Adelaide Electric Supply Co., Ltd., reports a gross revenue of £447,826 for the year ended August 31st, a decrease of £86,196, and operating expenses and taxes of £299,015, a decrease of £90,794, as compared with last year. The net revenue was £318,491, of which £85,569 was allocated to general reserve and £15,000 to contingency account, leaving a balance of £217,922. The directors recommend a final dividend for the half-year on the 8 per cent. preferred ordinary stock and a final dividend of 4½ per cent. on the ordinary stock, making 8½ per cent. for the year, leaving £2,922, which added to the balance from last year, makes £34,422 to be carried forward.

Parkinson & Cowan, Ltd., announce that having regard to the prolonged economic depression and its effect on the trading operations of the subsidiaries, particularly in Australia, they have decided to defer consideration of the question of a dividend on the ordinary shares in respect of the year to March 31st next until the accounts for the year are available. For 1930-31 an interim distribution of 2½ per cent. was made, but there was no final dividend.

Companies Struck off the Register.—The names of the undermentioned companies have been struck off the Register and they are thereby dissolved:—

Bell Electrical Co. (Northern), Ltd.
Chagford and Devon Electric Light Co., Ltd.
Nelson Electric Co., Ltd.

Companies to be Struck off the Register.—The names of the undermentioned companies will be struck off the Register at the expiration of three months, unless cause is shown to the contrary:—

Gas and Electric Securities, Ltd.
Norton Wireless Co., Ltd.
Reflex Radio Co., Ltd.

Associated Electrical Industries, Ltd., reports that the result of the recent issue of 1,399,560 new £1 ordinary shares was as follows:—Rights to new shares exercised by shareholders, 956,454; applications for excess shares, 211,688; balance to be taken up by guarantors (less applications on or before December 24th from shareholders resident abroad), 231,418.

The Cia. Hispano-Americana de Electricidad ("Chade") has declared an interim dividend at the rate of 30 gold pesetas on the series "A," "B" and "C" shares and at 6 gold pesetas on the series "D" and "E" shares.

Mann Egerton & Co., Ltd., report a net profit for the year ended September 30th of £17,143, as against £14,614 in the preceding year, to which is added £10,524 brought in. The preference dividend is paid and £15,042 is carried forward.

The International Telegraph and Telephone Co. has announced a dividend of 15 cents, as compared with 25 cents last quarter.—*Reuter* (New York).

The Eastern Telegraph Co., Ltd., has announced a dividend at the rate of 3½ per cent. per annum, less tax, on the preference stock for the quarter ending December 31st.

The Lisbon Electric Tramways Co. has declared an interim dividend of 3 per cent. net, on the ordinary shares (same).

The Canadian General Electric Co. has announced a quarterly dividend of $1 per share on the common shares.

Stocks and Shares

TUESDAY EVENING.

THE great struggle amongst the nations nowadays is carried on around the gold standard. A number of countries, Great Britain included, have been forced by circumstances to abandon their previous policy in regard to exports of gold, and this week it is announced that Japan is to be numbered amongst those who have joined the majority. Expectation looks for Holland and South Africa to be the next two that will join the same ranks. The fluctuations in sterling continue to play a large part in determining the course of Stock Exchange prices. The adjournment of Parliament, before anything has been done in the direction of the imposition of tariffs upon imports of iron and steel, has given rise to a measure of disappointment, although sound opinion is inclined to commend the Government for the caution that it shows in dealing with questions of such intricacy, and, at the same time, of such high consequence.

London Lighting Companies

Hints have been given here from time to time that those London electricity supply companies whose dividends are to be reduced, under the Act, to 7 per cent. next year, are likely to take such steps in the way of distributing their reserve funds as shall partially compensate shareholders for the loss of income which would be incurred by the lowering of dividends to 7 per cent. The companies have been making provision for some time past for meeting this decrease in income, the first effect of which will not be noticed until the interim dividends are declared next August. The dividends in respect of the current six months will be declared without reference to the 7 per cent. standard, as the Act does not come into force until the beginning of the New Year. At this time, when a shrinkage of investment income is particularly unpleasant, proprietors of shares in the London electricity supply companies will be the more gratified to find that by distribution of their companies' reserve funds the cut in dividends is likely to prove negligible.

Brompton and Chelsea Companies' Action

The first two companies to make a move in this direction are the Brompton & Kensington and the Chelsea Electricity Supply Companies. The Brompton is to hold a meeting on the Thursday in this week, to consider resolutions for increasing the capital to £450,000 by the creation of 50,000 ordinary shares, ranking for dividend as from January 1st next, and capitalising the sum of £29,855, being part of the undivided profits in the special reserve fund. This £29,855 will be applied to paying up in full an equal number of £1 shares, and the latter are to be distributed amongst the ordinary shareholders in due proportion. The Chelsea Company's proposal is on similar lines: the sum of £23,387 standing to the credit of the special reserve fund is to be capitalised and distributed in fully-paid £1 ordinary shares to the holders of the ordinary shares now issued. No doubt other companies will follow suit. It is expected that the reduction to the 7 per cent. rate will involve some slight diminution in income, even after allowing for the distribution of the reserves, but it will be comparatively small, and the proprietors of these electricity supply companies owe thanks to their boards for the foresight with which the shareholders' interests and income have been thus protected.

Central Electricity Debenture

Midland Counties and Midland Electric Power shares have gone back a trifle: Scottish Power are easier at 27s. 6d.; Whitehall preference lost 6d. at 22s. 6d. The feature amongst gilt-edged stocks is a reduction of 3½ points in Central Elec-

tricity 4½ per cent. debenture, though why this should stand 5 points higher than the similar stock of the London & Home Counties J.E.A. is not apparent on the face of it. Making due allowance for a slight difference in the interest dates, it would appear that the Central Electricity stock is distinctly the cheaper of the two. The only change in prices amongst the Home electricity supply group is a decline of 6d. to 43s. 3d. in County of London ordinary.

Home Railways

Central London assented has fallen two points to 68½. The preference stocks of the City and South London are each five down, at 82½. Otherwise, the Underground group shows no change in quotations. Until Parliament reassembles next February, nothing can be done, of course, in connection with the London Passenger Transport Bill. Dividend estimates are current in respect of the principal companies. The District is expected to maintain its 5 per cent. dividend, but there is room for speculation in the possibilities of what the Metropolitan may do. A year ago, the dividend was at the rate of 4½ per cent., the interim dividend paid last July was at the rate of 2 per cent. per annum. It is thought that the railway may possibly pay 3 per cent. for the full year. On Underground Electric ordinary shares, the usual 8 per cent. is anticipated. In the Home tramway group, London and Suburban Traction preference are slightly better at 9s. 6d. Business was done a week ago at 8s. 1½d. London United Tramway debenture remains at 57½. The company has convened a meeting for January 5th next to pass a resolution authorising the company to use trolley vehicles upon an additional route in Surrey.

Cables and Wireless

The outstanding feature in the Cables and Wireless list is a fall of £1 in Globe Telegraph and Trust ordinary shares, reducing the price to 8. This is 45s. lower than the quotation last month, when it was argued that the shares were overvalued, in view of the company's holdings in Cables and Wireless, and the price at which these last-named stood. Globe preference have receded to 7½, at which the yield on the money is 8 per cent. A fall of £2 has lowered Great Northern Telegraphs to 20½, some doubt being entertained as to whether the company will be able to continue the full 20 per cent. dividend which it has lately been paying. Cables and Wireless stocks are dull, the preference going back to 50. Anglo-American Telegraphs are easier also, the preferred and deferred both showing falls of 10s. Anglo-American Telephone and Telegraph at 190 is 10 points lower, in consequence of the slight improvement that has occurred in sterling, and Internationals at 13½ are 4½ points down, upon selling from New York.

Ekco

Lively dealings have been taking place in the shares, preference and ordinary alike, of E. K. Cole, which were offered, it will be remembered, a fortnight ago at £1 for the preference and 5s. for the ordinary. The ordinary rose to 12s. before reacting to half-a-guinea, while the preference, after opening about 2s. 6d. discount, have receded to 3s. 6d. discount. It is said that the company is doing well, and that it is not unduly bothered at present by competition.

Manufacturing and Equipment Shares

The new issue of 1,399,500 new ordinary shares of Associated Electrical Industries made to existing shareholders, who were offered the new shares at a guinea each, was taken by proprietors to the extent of 84 per cent., the balance going to the guarantors. The company received applications for excess shares to the extent of 211,000. The guarantors were called upon to take up 231,000. The price of the old shares remains at 21s. 3d. The market generally is heavy. Falls are shown by British Aluminium, Crompton Parkinson, Callender's, Henley's, Johnson and Phillips, Telegraph Constructions, and Siemens. English Electric of both classes, ordinary and preference, have gone back to 7s. 6d. The Stock Exchange market offers no further explanation for its dullness other than that already mentioned here: namely, a mild feeling of disappointment at the tardiness of industry to show greater signs of vitality, coupled with the uncertainty which prevails as to the manner in which tariffs will affect the profits of the various companies. Babcock & Wilcox, after improving to 49s. 6d., reverted to the previous figure of 48s. 9d., and Vickers have been maintained at a shade over 8s.

Miscellaneous Matters

The departure of Japan from the gold standard led to a weakening of the price of Tokyo Electric 6 per cent. first mortgage bonds, which previously had been standing at 94. The price has dropped to 86½, but this is ex the half-yearly interest. The Prime Minister of Canada has emphatically denied an American rumour to the effect that Canada had gone off the gold standard. Canadian utility shares have been a dull market during the past few days. Falls are shown in Canadian General Electric at 63¼, which are 4 down. British Columbia Power "A" weakened to 29¼, Shawinigans to 27½. Electrical Development of Ontario dropped 5 to 125, and Montreal Light, Heat and Power 3 to 38. Power Corporation of Canada at 28½ are 2 lower, and Toronto Power at 92½ mark a fall of 5. Amongst American shares, Consolidated Gas and Electric Light of Baltimore at 88½ show a loss of 4.

Amongst miscellaneous shares, Electrical Finance and Securities 7 per cent. preference gave way to 23s. The rubber share market has subsided into a comatose condition.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES.

	Nom.	Approx. Dividend. 1929.	1930.	Price, Dec. 15, 1931.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole		15	15	57/6	—	5 4 4
Brompton Ordinary		8½	8½	27/6	—	5 1 0
Central Electricity 4½% Deb.	Stock	—	4½	82½	—3½	5 9 1
Charing Cross Ordinary	1	8½	8½	29/–	—	4 16 7
Chelsea	1	8⅞	8⅞	26/–	—	5 7 8
City of London	1	10	10	35/–	—	5 14 3
Clyde Valley	1	8	8	31/3	—	5 2 5
County of London	1	11	11	43/3	—6d.	5 1 7
Edmundsons' 7% Pref.	1	7	7	23/6	—	5 19 2
Elec. Supply Corporation	1	11	11	41/3	—	5 6 6
Kensington Ordinary	1	8	8	29/–	—	4 16 7
Lancs. Light and Power	1	7	6½	25/–	—	5 4 0
London & Home Counties 4½% Deb.	Stock	—	—	87½	—	5 2 10
London Electric	1	8½	9	33/–	—	5 9 1
Metropolitan	1	9	10	38/9	—	5 3 3
Midland Counties	1	6½	7	26/3	—9d.	5 6 8
Mid. Elec. Power	1	15	8	28/9	—6d.	5 11 4
Newcastle-on-Tyne Ordinary	1	6	6	23/9	—	5 1 1
Do. 7% Pref.	1	7	7	26/–	—	5 7 8
Notting Hill 6% Pref.	10	6	6	10½	—	5 14 3
North Met. Elec. 6% Pref.	1	6	6	22/6	—	5 6 8
St. James' and Pall Mall	1	8	8	29/–	—	4 16 7
Scottish Power	1	8	8	27/6	—9d.	5 16 5
South London	1	8½	8½	25/6	—	5 9 8
Urban Ordinary	1	7	7	27/–	—	5 3 8
Westminster Ordinary	1	8½	8½	28/–	—	5 0 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	22/6	—6d.	6 13 4
Yorkshire Elec.	1	8	8	32/–	—	5 0 0

HOME RAILS.

Central London Ord. Assented	Stock	4	4	68½	—2	5 16 10
Metropolitan	,,	4	3½	38½	—	9 1 10
Do. District	,,	5	5	61½	—	8 2 8
Underground Electric	1	8	8	1	—	7 16 1

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref.	Stock	6	6	92½	—½	6 9 9
Do. Def.	,,	1½	1½	22½	—½	6 13 4
Cables & Wireless 5½% Pref.	Stock	5½	5½	50	—1½	—
Do. A 7½% Ord.	,,	Nil	—	17½	—1	—
Do. B Ord.	,,	Nil	—	11	—	—
Globe Tel. and T. Ord.	10	10	8½	8	—1	—
Do. do. Pref.	10	6	6	7½	—½	8 0 0
Great Northern Tel.	10	20	20	20½	—2	9 15 2
Marconi-Marine	1	15	15	33/9	—	8 17 5
Oriental Telephone Ord.	1	12	12	2½	—	*5 13 0

HOME AND FOREIGN TRAMS, ETC.

Anglo-Arg. Trams First Pref.	5	5½	—	6/3	—	—
Do. do. 2nd Pref.	5	6	—	6/3	—	—
Do. do. 5% Deb.	Stock	5	5	12½	—	—
British Electric Traction Def. Ord.	,,	5	5	750	—	—
Do. do. Pref. Ord.	,,	8	8	115	—4	6 19 2
Brazil Traction	100	8	—	13⅝	—⅛	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	89	—	5 12 4
London & Sub. Trac. 5% Pref.	1	Nil	Nil	9/6	+3d.	—
London United Tram Deb.	Stock	4	4	57½	—	6 19 2
Mexico Trams, 5% Bonds	—	5	5	30½	+¼	16 8 0
Mexican Light Common	100	Nil	Nil	20	—5	—
Do. 7% Pref.	100	7	7	25	—10	20 0 0
Do. 1st Bonds	—	5	5	62	—	8 1 4
Victoria Falls Ord.	1	15	15	56/3	—⅛	5 6 9
Yorkshire (West Riding)	1	Nil	Nil	6/3	—	—

MANUFACTURING COMPANIES.

Assoc. Elec. Ord.	1	6	6	21/3	—	5 12 11
Do. Pref.	1	8	8	27/6	—	5 16 5
Babcock & Wilcox	1	15	14	48/9	—	*5 14 10
British Aluminium Ord.	1	10	10	25/–	—⅛	8 0 0
British Insulated Ord.	1	15	15	2⅞	—	5 4 4
Brush Ord.	Stock	10	5	70	—	7 2 10
Callender's	1	15	15	2⅝	—⅛	5 14 3
Do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Parkinson Ord.	5/–	30	30	20/9	—1/9	7 4 7
Do. 8% Pref.	1	8	8	27/6	—6d.	5 16 5
Edison-Swan 1st Pref.	1	7½	7½	23/3	—	6 9 0
Do. 5% Deb.	Stock	5	5	91½	—	5 9 3
Electric Construction	1	5	Nil	10/–	—	—
Enfield Cable Ord.	1	25	25	4	—	6 3 1
English Electric	1	Nil	Nil	7/6	—½	—
Do. do. Pref.	1	Nil	Nil	7/6	—⅛	—
Ferranti Pref.	1	7	7	21/3	—	6 11 9
G.E.C. Pref.	1	6½	6½	24/–	—	5 8 4
Do. Ord.	1	14	10	42/6	—	4 14 2
Henley's	1	30	30	5⅛	—⅛	5 18 0
Do. 4½% Pref.	5	4½	4½	4	—	5 12 6
India-Rubber	1	Nil	Nil	6/3	—	—
Johnson & Phillips	1	10	10	23/9	—⅛	8 8 5
Siemens Ord.	1	7½	7½	22/–	—6d.	6 16 4
Telegraph Construction	12	10	7½	12½	—½	7 4 0

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this Journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1930.

14,247. "Electric condensers." Dubilier Condenser Co. (1925). Ltd. (L. Edenburg). May 9th, 1930. (361,332.)

14,295. "Arrangement for showing at a glance the consequences of switching operations in power distribution installations." Akt.-Ges. Brown Boveri et Cie. June 3rd, 1929. (361,309.)

20,683. "Cascade connected electrical groups." International General Electric Co., Inc. July 9th, 1929. (361,339.)

21,316. "Mounting or support for sound-boxes and their associated tone arms, or for electrical pick ups of gramophones or like sound reproducing apparatus, or for stylus holders or cutting-tool holders of sound-recording apparatus." J. Lowndes. July 14th, 1930. (361,285.)

21,334. "Feed water supply systems for boilers." W. Eccles and Associated Electrical Industries, Ltd. July 14th, 1930. (361,366.)

21,800. "Electric illumination control systems." British Thomson-Houston Co., Ltd. July 25th, 1929. (361,314.)

21,874. "Moving coil sound recorders." H. A. M. Clark. July 19th, 1930. (361,393.)

21,955. "Gaseous electric discharge devices." British Thomson-Houston Co., Ltd. July 27th, 1929. (361,394.)

23,933. "Electric motor starting switches." Brookhirst Switchgear, Ltd., and J. A. Hirst. Aug. 11th, 1930. (361,368.)

24,147. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. Aug. 12th, 1929. (361,369.)

24,173. "Suspension clamps for electric cables." J. G. Miller and Bullers, Ltd. Aug. 12th, 1930. (361,372.)

24,496. "Thermionic valve circuits as applied to radio-telephonic systems and apparatus." Graham Amplion, Ltd., and A. D'A. Hodgson. Aug. 15th, 1930. (361,351.)

24,593. "Directional aerial systems." Marconi's Wireless Telegraph Co., Ltd., and N. Wells. Aug. 16th, 1930. (361,375.)

24,681. "Machines for winding dynamo-electric machines." British Thomson-Houston Co., Ltd. Aug. 16th, 1929. (361,323.)

24,703. "Methods of applying a single coating of insulating material or like plastic material to a plurality of electrical conductors or like wires or strands by extrusion followed by a vulcanising or similar hardening process." Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). Aug. 18th, 1930. (361,326.)

24,704. "Combined vulcanising and extrusion apparatus for covering wires." Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). Aug. 18th, 1930. (Addition to 361,326.) (361,327.)

24,805. "Electrical insulators." Hermsdorf-Schomburg-Isolatoren Ges. Aug. 19th, 1929. (361,404.)

24,843. "Television and like facsimile telegraphy systems." W. E. Williams. Aug. 19th, 1930. (361,355.)

24,912. "Controlling devices for electric switches used in connection with liquid measuring and dispensing apparatus." G. F. Wagstaff and Wayne Tank & Pump Co., Ltd. Aug. 20th, 1930. (361,380.)

25,006. "Electrically controlling railway points and signals and the like." Westinghouse Brake & Saxby Signal Co., Ltd. Sept. 30th, 1929. (361,412.)

25,007. "Electric control systems for railway traffic controlling apparatus." Westinghouse Brake & Saxby Signal Co., Ltd. Oct. 9th, 1929. (361,413.)

25,497. "Sound record films." Electrical Research Products, Inc. Sept. 5th, 1929. (361,438.)

25,542. "Electromagnetic valve." J. L. Musgrave and R. Crittall & Co., Ltd. Aug. 27th, 1930. (361,440.)

25,543. "Electromagnetic valve." J. L. Musgrave and R. Crittall & Co., Ltd. Aug. 27th, 1930. (361,441.)

25,575. "Electric switches with vapour arc quenching chambers." Siemens-Schuckertwerke Akt.-Ges. Nov. 22nd, 1929. (361,442.)

25,868. "Arrangements for regulating the heating of glass electric current rectifiers." Siemens-Schuckertwerke Akt.-Ges. Nov. 28th, 1929. (361,448.)

25,979. "Circuit arrangements for the detection of high-frequency oscillations with subsequent amplification." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Oct. 4th, 1929. (361,450.)

26,642. "Electric spit roasting device." A. Duppach and L. Merle. September 6th, 1930. (361,459.)

26,771. "Electric signalling systems." Siemens Bros. & Co., Ltd., and J. H. Broome. September 8th, 1930. (361,462.)

26,775. "High-potential dynamo-electric generators." Siemens-Schuckertwerke Akt.-Ges. September 9th, 1929. (361,463.)

26,959. "Electrical apparatus such as sound reproducing or transmitting instruments, telephone or telegraphic relays, or the like." S. G. Brown. September 9th, 1930. (361,464.)

27,313. "Electric commutators." S. J. Watson and A. O. Hinchliff. September 12th, 1930. (361,467.)

27,417. "Scanning discs for use in conjunction with television and like apparatus." L. F. Batstone and B. T. Hogben. September 13th, 1930. (361,470.)

27,808. "Calibration and testing of electricity meters." Ferranti, Ltd., and V. Z. De Ferranti. September 17th, 1930. (361,480.)

28,836. "Electrical incandescent lamps." E. Bornand and H. A. Schlaepfer. October 4th, 1929. (361,496.)

29,895. "Mercury-vapour rectifiers." Akt.-Ges. Brown, Boveri et Cie. October 16th, 1929. (361,515.)

30,138. "Electric circuit controllers." Igranic Electric Co., Ltd., and A. H. Curtis. October 8th, 1930. (361,517.)

30,163. "Electromagnetic switches as used in telephones or like systems." Siemens Bros. & Co., Ltd., and D. A. Christian. October 8th, 1930. (361,519.)

30,871. "Oil-insulated cables." Telefonaktiebolaget L. M. Eriesson. October 16th, 1929. (361,528.)

30,902. "Apparatus for transmitting indications to a distant point." International General Electric Co., Inc. October 16th. 1929. (361,529.)

31,373. "Electromagnetic relays." Coventry Automatic Telephones, Ltd., and C. Myers. October 20th, 1930. (361,535.)

31,400. "Telephone systems." Siemens Bros. & Co., Ltd., and R. G. Dixon. October 20th, 1930. (361,536.)

31,519. "Electrically heated curling tongs." R. Bosch Akt.-Ges. and A. Rehm. October 21st, 1930. (361,538.)

31,526. "Time controlled switches for wireless receiving sets and the like." R. Cross. October 21st, 1930. (361,539.)

31,779. "Telegraphic exchange systems." C. Lorenz Akt.-Ges. October 23rd, 1929. (361,546.)

32,596. "Systems of electric remote control or supervision." Coventry Automatic Telephones, Ltd., and N. C. Smart. October 30th, 1930. (361,558.)

32,643. "Methods of manufacturing electron-emitting coated cathodes." Allgemeine Elektricitats-Ges. November 8th, 1929. (361,560.)

32,766. "Subaqueous sound receiving apparatus." Submarine Signal Co. October 31st, 1929. (361,566.)

33,400. "High or low tension insulators." Johnson & Phillips, Ltd., and C. J. H. Stevens. November 6th, 1930. (361,583.)

33,706. "Apparatus for registering the flow of gas, electricity or liquid." D. O. Bremner. November 8th, 1930. (Cognate applications 35,308/30, 37,582/30, 15,105/31 and 15,955/31.) (361,586.)

35,129. "Electromagnetically operated mercury switch for controlling electric circuits." M. Payne. November 21st, 1930. (361,610.)

35,256. "Switching systems controlling a stand-by source of electric power." H. G. G. Fairweather (Atlantic Refining Co.). November 22nd, 1930. (361,614.)

35,583. "Contact devices for electrical apparatus." K. Kesl. November 26th, 1930. (Addition to 340,043.) (361,625.)

37,307. "Means for testing electric cables during manufacture." Hackethal-Draht-und Kabelwerke Akt.-Ges. December 10th, 1929. (361,651.)

38,832. "Mounting of electrical units, such as fuses in distribution boxes and the like." J. A. Crabtree. December 24th, 1930. (Cognate application 1,990/31.) (361,670.)

1931.

518. "Road traffic-signalling systems and apparatus therefor." British Thomson-Houston Co., Ltd. January 6th, 1930. (361,685.)

2,786. "Electric motor control systems." British Thomson-Houston Co., Ltd. January 28th, 1930. (361,719.)

3,316. "Electron-discharge devices." British Thomson-Houston Co., Ltd. February 1st, 1930. (361,726.)

3,689. "Electric cable conduits." Telefonaktiebolaget L. M. Ericsson. February 6th, 1930. (361,729.)

4,566. "Electric transformer and like tanks." English Electric Co., Ltd., and W. E. M. Ayres. February 13th, 1931. (Addition to 350,369.) (361,736.)

4,582. "Dry electric rectifiers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 7th, 1930 (361,737.)

4,584. "Dry electric rectifiers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 8th, 1930. (361,738.)

4,779. "Electric condensers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 21st, 1930. (361,741.)

4,880. "Electric cables." British Thomson-Houston Co., Ltd. February 17th, 1930. (361,742.)

7,013. "Method of and apparatus for metering the interchange of energy between electricity generating stations." Landis & Gyr Soc. Anon. March 8th, 1930. (361,758.)

7,144. "Means for obtaining current from a high-tension transmission line for operating instruments." British Thomson-Houston Co., Ltd. March 7th, 1930. (361,762.)

7,832. "Induction controllers." Electrical Apparatus Co., Ltd., and R. H. Barbour. March 13th, 1931. (Addition to 330,819.) (361,766.)

8,169. "Luminous discharge rectifier tubes." Egyesult Izzolampa Es Villamossagi Rezvenytarsasag. March 18th, 1930. (361,770.)

8,599. "Mercury-vapour rectifiers." Akt.-Ges. Brown, Boveri et Cie. March 26th, 1930. (361,776.)

11,472. "Electric luminous discharge tubes." General Electric Co., Ltd. July 7th, 1930. (361,804.)

12,553. "Electrically driven vehicles." C. Sacerdoti. October 8th, 1930. (Divided application on 4,243/30.) (Addition to 4,243/30.) (361,808.)

17,842. "Method of increasing the symmetry of long-distance submarine cables." Siemens & Halske Akt.-Ges. June 30th, 1930. (361,824.)

27,031. "Plugs for stoppers for electric storage batteries." F. Temple. September 8th, 1930. (Divided application on 26,714/30.) (361,832.)

28,335. "Telephone and like electric cables." Hackethal-Draht-und Kabelwerke Akt.-Ges. July 10th, 1929. (Divided application on 20,972/30.) (361,331.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 9th :—

Osram. No. 526,738. Class 8. Photo-electric cells and parts thereof.—General Electrical Co., Ltd., Magnet House, Kingsway, W.C.2.

Lafoy. No. 526,845. All goods in Class 8.—Sparks-Withington Co., U.S.A. (British representatives, White, Langner, Stevens, Parry & Rollinson, 5-9, Quality Court, Chancery Lane, W.C.).

Claudegen (lettering and design). No. 526,985. Class 8. Electrically illuminated neon signs.—Claude-General Neon Lights, Ltd., Queen's House, Kingsway, W.C.2.

Two Men and Cable (design only). No. 527,042. All goods in Class 13.—C.A.V.-Bosch, Ltd., Warple Way, Acton Vale, W.3.

Belvic. No. 526,257. Class 47. Lubricating grease.—Metropolitan-Vickers Electrical Co., Ltd., Bush House, Aldwych, W.C.2.

Insulac. No. 523,676. Class 50. Electrical insulating varnish.—Hadfield's (Merton), Ltd., Western Road, Mitcham, Surrey.

Linsden. No. 526,700. Class 50. Moulded articles of synthetic resinous materials.—British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Accrington.—Extensions to Spring Hill School (£8,079); W. Livesey & Sons, Blackburn.

Ayrshire.—School and clinic, Auchinleck, with electrical work, for the county E.C.; W. Reid, county architect, 14, Wellington Square, Ayr.

Bedford.—Houses (232), London Road Estate; borough engineer.

Blackpool.—Houses (22), Marton Drive, for J. Giegson & Son. Houses (70), Watson's Road, for J. W. Harrison. Houses (22), Kingston Avenue and Priory Gate, for P. W. Emery & Son.

Blyth.—Houses (50), for the T.C.; L. Leeper, engineer, Town Hall.

Boston (LINCS).—Works extensions, Bargate End, for J. & J. Beaulah, Ltd.

Brighton.—Houses (22), Widdicombe Way; Braybons, Ltd. Omnibus garage, Whitehawk Road; Thomas Tilling, Ltd. Shops (12), Carlton Hill, and reconstruction of 195-9, Western Road; borough engineer.

Burnley.—Shop, Chancery Lane; Prices Tailors, Ltd.

Bury (LANCS).—Two schools (£22,100), for the borough E.C.; borough engineer.

Carlisle.—Houses (166), various sites; city engineer.

Cheshire.—School, Whitchurch, for the county E.C.; director of education, Chester.

Chester.—School, Lache Estate, for the borough E.C.; director of education.

Chippenham (WILTS).—Houses (72), Woodlands, for the T.C.; borough surveyor.

Clayton-le-Moors (LANCS).—Houses (24), Oakenshaw, for the U.D.C.; Blakeley & Son, builders, Barnoldswick.

Clitheroe.—Reinstatment of Co-operative Kinema; manager.

Clun (SALOP).—Houses (24), for the R.D.C.; H. A. Elliott, surveyor, Bishop's Castle.

Cornwall.—Girls' secondary school, St. Austell, for the county E.C.; J. Williams & Co., builders.

Coulsdon.—Houses (100), Woodlands Estate (£41,685); V. G. Selwood & Co.

Cowes (I.O.W.).—Houses (20), for the U.D.C.; surveyor.

Cuddington (EPSOM).—Houses and shops, Worcester Park Farm Estate; P. Harvey (Sales), Ltd., Moorgate Street Chambers, London, E.C.

Dagenham (ESSEX).—Library (£3,885), for the U.D.C.; surveyor.

Dawley (SALOP).—Houses (50), for the U.D.C.; surveyor.

Dorchester.—Houses (21), Coburg Road, for L. A. Short. Alterations to 13, Cornhill; Boots (Western), Ltd.

Douglas (I.O.M.).—Alterations to the Hotel Metropole; J. P. Smith.

Dudley.—School, Brewery Fields (£21,884), for the borough E.C.; director of education.

Durham.—New premises for Johnston Secondary School; county education architect.

Ealing.—Houses (132), North Circular Road; W. Thorpe, architect, Edgware, Middlesex. Houses (43), Bideford Avenue; R. Fielding & Son, Stanhope Road, Blackpool. Houses (22), Coston's Lane; Selected Sites Development Trust, Ltd. Office and workshop, Briarhill Estate, Northolt; J. & H. Boothman (1930), Ltd. Shops, North Circular Road (17). Western Avenue (30), and 30 houses, Dawlish Avenue; G. L. Russell, architect, 16, Basinghall Street, E.C.2.

Ellesmere Port and Whitby (CHESHIRE).—Houses (75), Grange Farm Estate, for the U.D.C.; surveyor.

Essex.—School, Rainham Road, Hornchurch, for the county E.C.; J. Stuart, county architect, Chelmsford.

Eston (YORKS).—Factory extension, Leeds Road; G. Harrison & Sons.

Fareham (HANTS).—Conversion of premises, Gosport Road, into church, for West Street Baptist trustees; Rev. W. H. Tebbit, pastor.

Fleetwood.—Public elementary school, Poulton Road (120 places), for the Rev. J. McKenna, St. Wulstan's; R. Mercer, architect, 11, Chapel Street, Preston.

Friern Barnet.—Clearance scheme, South Ward; U.D.C. surveyor. Church, Friern Barnet Lane and Torrington Park; Wesleyan trustees.

Glasgow.—Houses (534), Cuthelton; housing director and trade contractors.

Golborne (LANCS).—Sewage disposal works; C. J. Lomax & Son, chartered civil engineers, 37, Cross Street, Manchester.

Hinckley.—Extensions to works, Southfield Road, for Bennett Brothers; W. M. Sharpe & Son, Ltd., builders, East Short Street, Leicester.

Irish Free State (GOREY, Co. WEXFORD).—Houses (50), at the Garden City, for the County Board of Health; G. Flood and P. Dunbar, engineers, Board of Health County Home, Enniscorthy.

Lancaster.—New branch, Lancaster Road, Torrisholme, for the Lancaster and District Co-operative Society, Ltd., 51, Church Street; R. W. Jackson, architect, 46, Church Street.

Leigh (LANCS).—Post office; H.M. Office of Works, King Charles Street, S.W.1.

Lincolnshire.—Houses (22), for West Kesteven R.D.C.; surveyor, Bank Street, Lincoln.

Little Hulton (LANCS).—Houses (36), Alexandra Road; U.D.C. surveyor, Council Offices.

London (LEWISHAM).—Equipment of Municipal Buildings; town clerk. (WOOLWICH).—Houses (400), Middle Park Estate, Eltham, with electrical work, for the T.C.; borough surveyor.

Machynlleth (MONT).—Houses (20), for the U.D.C.; B. Brooks Evans, surveyor. Hospital, for the Hospital Committee; Mrs. Powell, secretary.

Malton (YORKS).—Refuse disposal plant; W. A. Jackson, U.D.C. surveyor.

Manchester.—Houses (316), Wythenshawe Estate; city housing director.

Mansfield Woodhouse (NOTTS).—Sewage disposal works, with electrical pumping station, for the U.D.C.; Elliott & Brown, engineers, Burton Buildings, Parliament Street, Nottingham.

Motherwell.—Bakery (electric plant) for Mrs. Fraser; the manager. Library, Wishaw, for the T.C.; burgh surveyor.

Newark (NOTTS).—Reconstruction of school; rector, Holy Trinity R.C. church.

Newcastle-on-Tyne.—Alterations to the Black Furnace Hotel; S. H. Lawson, architect, Emerson Chambers. Business stores, Northumberland Street (£65,000). for C. & A. Modes, Ltd., 380, Oxford Street, London, W.; S. Miller, Ltd., builders.

Newport (MON).—Secondary school, Firbank Estate, for the E.C. Cinema, corner of Dock Street and Friars Street; Mr. Tilney. Shops and offices, Cambrian Road; G.W.R. architects' department.

Oldbury (BIRMINGHAM).—Houses (111), Chestnut Estate, Quinton; A. Robinson. Houses (140), Newbury Lane Estate; borough engineer. Remodelling of sewage works (£46,000); Willcox & Raikes, engineers. Junior school, Bleakhouse (£19,250), for the E.C.

Oldham.—Houses (30), Honeywell Lane, for the T.C.; borough surveyor.

Oxford.—Houses (24), Fernhill Road; Ives & Rushby, Coventry. Additions, 62, Holywell Street; Merton College governors. Cinema, Cowley Road; G. T. Gardner. Conversion of isolation hospital into general hospital, and new isolation hospital at Headington; medical officer and city surveyor.

Oxfordshire.—Schools, Headington Estate and Wheatley, for the county E.C.

Pickering (YORKS).—Sewage disposal and purification works; H. Smith, U.D.C. engineer, 36, Burgate.

Portree (SKYE).—Boys' hostel (£20,000), for the Carnegie Trust; secretary.

Portsmouth.—Buildings at aerodrome (£14,725); borough engineer. Alterations to 14, King's Terrace; General Accident, Fire & Life Corporation, Ltd. Alterations to Queen's Cinema and Theatre Royal; licensees. Three blocks of flats, Tangier Road; W. Ford.

Prestwick (AYRSHIRE).—Houses (26), Gray Street, for W. Govan & Sons.

Rugeley (STAFFORD).—Houses (30), Hagley; U.D.C. surveyor.

Sanderstead.—Houses (150), Croham Heights Estate; R. Costain & Sons, Ltd.

Shrewsbury (SALOP).—Theatre, with electrical work, for Shrewsbury Empires, Ltd.; S. L. Bernstein, director.

Southport.—Branch bank at Hillside, Birkdale, for the Westminster Bank Ltd.; A. Sutcliffe, architect, 413, Lord Street. Cinema, Kingsway; The Scala, Ltd. Gymnasium, Rawlinson Road; Miss Hodgson.

Sunderland.—Conversion of the Avenue Theatre into cinema for Moss Empires, Ltd.

Truro (CORNWALL).—Houses (50), Hendra, for the T.C.; F. A. Barnes, borough surveyor.

Tynemouth.—Houses (26), North Chirton Estate; F. R. N. Haswell & Son, architects. Alterations, tramway depôt, John Street, Cullercoats, for the Electric Traction Co.; W. Stockdale, architect. School, near Silkey's Lane, for the E.C. Extensions to Moor Park Hospital (£4,250); borough engineer.

Urmston.—Cinema; W. Thornley, architect, Wallgate, Wigan.

Wakefield.—Improvements to Eastmoor and Alverthorpe schools; city architect.

Wallington (SURREY).—Extensions, Gaiety Theatre, for W. Clough.

Warrington.—Congregational church, Elmwood Avenue (£5,000); P. Silcock, architect, 6, Egypt Street.

Wellingborough.—Extensions to premises, Redwell Road; C. Adams & Co., builders, Finedon Road.

West Bromwich.—Extensions, General Hospital (£16,000); W. Jackson, Ltd., builders, Langley.

West Drayton (MIDDLESEX).—Building estate development, Station Road; Bagley & Cherry Orchard Estates, Ltd.

West Sussex.—Police headquarters, Chichester (£9,998), for the C.C.; T. Couzens & Sons, builders, West Marden. Extensions, Lancastrian School, Chichester (£7,500), for the E.C.; county architect, Chichester.

Whiston (LANCS).—Extensions, including laundry, at Sanatorium, for the R.D.C.; Wainwright & Gornall, architects, 17, George Street, St. Helens.

Wigan.—Houses (40), Almond Brook Road, for the T.C.; borough surveyor.

Wincanton (SOMERSET).—Houses (20), Queen Camel, for the R.D.C.; H. N. Alves, architect, 27, High Street, Glastonbury.

Woking.—Houses (140) for the U.D.C.; Eadie & Co., contractors, 29, Waterloo Road, Wolverhampton.

Wrexham.—Six sewage disposal schemes, with pumping plant, for the R.D.C.; J. H. Edwards, engineer, Imperial Buildings.

Yeovil.—Re-erection of glove factory for Ricketts & Co.

Generation of Electricity, November, 1931

The official returns rendered to the Electricity Commissioners show that 1,095 million kWh was generated by authorised undertakers in Great Britain during the month of November, 1931, as compared with the finally revised figure of 1,035 million kWh in the corresponding month of 1930, or an increase of 5.8 per cent.

During the first eleven months of 1931 up to the end of November the total amount of electricity generated by authorised undertakers was 10,178 million kWh, as compared with the finally revised figure of 9,764 million kWh for the corresponding period of 1930, representing an increase of over 4 per cent.